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ACRONYMS AND ABBREVIATIONS

ACEC	Area of Critical Environmental Concern
af	acre foot
APD	Application for Permit to Drill
AUM	Animal Unit Month
B.P.	Before Present
BLM	Bureau of Land Management
CCFO	Carson City Field Office
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CRMP	Consolidated Resource Management Plan
DOE	Department of Energy
DOI	Department of the Interior
EA	Environmental Assessment
EIS	Environmental Impact Statemen
E.O.	Executive Order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
FLPMA	Federal Land Policy Management Act
FONSI	Finding of no Significant Impact
gpm	gallons per minute
H_2S	Hydrogen Sulfide
HA	Herd Area
HMA	Herd Management Area
HR	Hydrographic Region
IMPROVE	Interagency Monitoring of Protected Visual Environments
ITCN	Intertribal Council of Nevada
KGRA	Known Geothermal Resource Area
m	meter
MFP	Management Framework Plan
NAMS	National Air Monitoring Station
NCA	National Conservation Area
NDMR	Nevada Division of Mineral Resources
NDWP	Nevada Division of Water Planning
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NO_2	Nitrogen Dioxide
NOI	Notice of Intent
NRCS-SSURGO	Natural Resources Conservation Service-Soil Survey Geographic
NRHP	National Register of Historic Places
O_3	Ozone

OHV	Off-Highway Vehicle
OSHA	Occupational Safety and Health Act
Pb	Lead
PEA	Programmatic Environmental Assessment
pH	Measure of acidity or alkalinity
P.L.	Public Law
PM_{10}	Particulate Matter 10 microns or less
$PM_{2.5}$	Particulate Matter 2.5 microns or less
PVA	Prospectively Valuable Area (also "Potentially Valuable Area")
RAC	Resource Advisory Council
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Office
SLAMS	State and Local Air Monitoring Station
SO_2	Sulfur Dioxide
SPMS	Special Purpose Monitoring Station
SWDA	Solid Waste Disposal Act
TCP	Traditional Cultural Properties
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service
VRM	Visual Resource Management
WFO	Winnemucca Field Office
WSA	Wilderness Study Area

EXECUTIVE SUMMARY

INTRODUCTION

In May 2001 the President adopted a National Energy Policy to respond to our Nation's increasing energy needs. This policy recognizes the importance of how the Federal government can affect the supply and use of energy. In response to the policy, the Bureau of Land Management (BLM) developed an implementation strategy titled: *BLM Implementation of the National Energy Policy*. This plan identified a number of tasks that would streamline energy development on public lands. BLM, Nevada has received numerous applications to lease public lands for geothermal resources. A large number of these lease applications are located within the administrative boundary of the BLM Winnemucca Field Office (WFO).

To expedite processing of these pending lease applications, and meet the intent of the National Energy Policy, the BLM WFO has prepared this geothermal Programmatic Environmental Assessment (PEA) to satisfy requirements of the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA, and to update the Winnemucca District Regional Geothermal EA for land within the assessment area.

The proposed action is located in a defined assessment area within the lands managed by the BLM WFO and a portion of the Carson City Field Office (CCFO)(see Figure 2-1). The assessment area is comprised of three categories of leasable lands: Potentially Valuable Areas (PVAs), Known Geothermal Resource Areas (KGRAs)(competitive leases), and pending lease application sites (noncompetitive leases) (for pending lease applications, see Appendix H).

Lands not included for leasing consideration under the proposed action are any lands outside of the boundaries of the PVAs and KGRAs. These lands include Wilderness Areas, Wilderness Study Areas, Areas of Critical Environmental Concern, or National Conservation Areas. Also excluded are tribal lands, wildlife refuges, and private land with titles that include geothermal mineral rights.

DESCRIPTION OF THE PROPOSED ACTION

The Nevada BLM is considering leasing geothermal resources on certain public lands within the WFO administrative boundary and on all public lands, excluding wilderness study areas, in the Dixie Valley KGRA. Leasing in these areas is consistent with the WFO Paradise-Denio and Sonoma-Gerlach Management Framework Plans (MFPs) and the CCFO Consolidated Resource Management Plan (CRMP). Leasing considered under this EA does not include any WFO public land outside the boundaries of the 13 PVAs or KGRAs shown in Figure 2-1.

The proposed action is to consider leasing all or some of the geothermal resources within PVAs, KGRAs, and pending lease sites within the assessment area boundary. All pending and future geothermal resource leases within the assessment area would be subject to stipulations, mitigation measures, or performance standards developed from this analysis. Future lease applications would require a cultural resources inventory, and wildlife and sensitive and threatened/endangered species surveys within the WFO administrative boundary prior to leasing. Existing leases or other valid existing geothermal rights within the assessment area would not be subject to the stipulations, mitigation measures, or performance standards developed in this analysis; however, they would be subject to the above should they be dropped and leased again.

DESCRIPTION OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, all or some of the future leases for geothermal resources would be analyzed using the currently approved geothermal environmental assessment, *Winnemucca District Regional Geothermal/Oil and Gas Leasing Environmental Assessment (EA-NV-020-2-38), N-11821, June 1982* and policy guidelines titled: *Stipulations for Oil and Gas and Geothermal Leases, Winnemucca Office Instruction Memorandum No. 84-160 (3/84).* The No Action Alternative would be consistent with existing land use plans for the BLM WFO and CCFO. Processing leases under the No Action Alternative would require a supplemental NEPA analysis.

ISSUES

The BLM initiated a 30-day public scoping period from May 15, 2002 to June 14, 2002. In addition, two public scoping meetings were held; one on May 29, 2002 in Winnemucca, Nevada and the other on May 30, 2002 in Lovelock, Nevada. Issues identified through public scoping and internal BLM staff review include the following;

Lands and Realty. Leasing creates a valid existing right, which could affect other future land-use authorizations.

Recreation. Soaking and swimming in natural hot spring pools is a popular recreation activity. Concerns of hot spring users include destruction or degradation of the hot springs. Those involved in this activity do not want to be restricted or denied access to hot spring areas. Some believe that hot springs are spiritual places with healing powers.

Visual Resources. Visual resources could be adversely impacted during the exploration and/or development phases. Construction of roads, wells, ponds, power plants, warehouses, pipelines, and ancillary facilities could cause visual intrusions that adversely affect the setting of historic emigrant trails and other sensitive visual resource areas.

Wildlife. Loss of habitat from the "reasonably foreseeable development scenario" could adversely impact sage grouse, big horn sheep, mule deer, and antelope populations.

Sensitive Species. Hot Spring surface features include pools, mineral deposits, outflows, and other unique habitat features. Loss of habitat from the "reasonably foreseeable development scenario" could adversely impact sensitive plant and wildlife species.

Wild Horses and Burros. Loss of habitat and traditional water sources from the "reasonably foreseeable development scenario" could adversely impact wild horse and burro populations.

Cultural Resources. The exploration and/or development phases could destroy cultural resources or National Register-eligible sites. Construction of facilities and removal of vegetation could damage or expose previously hidden cultural resources.

Native American. Native American Religious concerns include loss or destruction of hot springs, which have spiritual importance or are areas of traditional uses such as healing.

EVALUATION FACTORS

- Air Quality
- Soils
- Hydrology and Water Quality
- Vegetation
- Noxious Weeds
- Land and Realty
- Recreation
- Visual Resources
- Wildlife, Migratory Birds, and Fisheries
- Threatened, Endangered, and Special Statue Species
- Wild Horse and Burro
- Geology and Minerals
- National Conservation Area, Wilderness, Wilderness Study Areas
- Range Resources
- Cultural Resources
- Native American Consultation
- Hazardous Materials/Waste and Solid Waste
- Socio-Economic
- Environmental Justice
- Paleontology

CONCLUSIONS

The process of leasing geothermal resources does not directly cause impacts to the human environment; however, future geothermal resources development could result in surface disturbance to some of the lands post-leasing. The "reasonably foreseeable development scenario" discloses potential impacts that could result once the lands are leased. The BLM would require a site-specific environmental analysis at the exploration and development stages to comply with NEPA.

Four separate and sequential phases of geothermal development could occur. The probable sequence and degree of environmental impact would be contingent upon the success or failure of each preceding phase. The four phases are: exploration, development, production, and close-out. Using this scenario as a guideline, the following is a comparison of the Proposed Action and No Action Alternative:

TABLE ES-1
SUMMARY OF ALTERNATIVES

Proposed Action	No Action Alternative
Air Quality	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," any impact would be minor in nature and localized to a small area. Under this alternative the mitigation measures and stipulations for future leases would be established using an updated Programmatic EA and therefore, more stringent protection measures.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Soils	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," geothermal exploration and development activities can be expected to cause disturbance to the landscape and soils. This could include clearing and grading access roads and trails, well sites, pipelines, power lines, and other infrastructure associated with exploration and production. Reclamation would be required following exploration and production activities.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Hydrology and Water Quality	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," environmental impacts cannot be determined for individual leases or for exploration, development, or production activities. Existing data describing surface water systems, groundwater reservoirs, geothermal reservoirs, the interrelationships of these systems, or specific exploration, development, and production activities are inadequate to determine specific effects of these activities on the region, PVAs, KGRAs, or pending leases. This updated PEA would permit inclusion of updated stipulations, mitigation measures, and/or performance standards specific to each lease, and could help	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

Proposed Action	No Action Alternative
to ensure the long-term health of the area's hydrologic system and water quality.	
Vegetation	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," there could be impacts to vegetation resources in the short term due to operational activity and construction. Long-term impacts to vegetation resources could occur due to upgrading of roads and the change in type of vegetation in areas that are reclaimed. Changes in vegetation due to construction could result in the introduction of weedy annual species and pioneering shrub species that would persist with continued disturbance and lack of maintenance. Weed control during operation and for at least five years after closure would mitigate this impact.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Noxious Weeds	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," each project would be evaluated on a case-by-case basis. Native vegetation in localized areas where facilities and utility corridors would be built or constructed could be damaged or destroyed by crushing, exposing roots, soil compaction, and blading for construction. The construction would open areas for weed invasion. The loss of native vegetation could result in the introduction of non-native, undesirable vegetation. During the exploration and development phases, noxious weeds could spread. The degree to which noxious weeds spread would be directly correlated to human activities and weed control efforts in the area. Although natural elements, such as wind and wildlife, would contribute to weed proliferation under this alternative, range animals (livestock and horses) and activities involving OHVs would contribute to most of the increased weed populations.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Lands and Realty	
Direct Impacts – Leasing creates a valid existing right, which could affect other future land-use authorizations.	Direct Impacts – Leasing creates a valid existing right, which could affect other future land-use authorizations.

Proposed Action	No Action Alternative
Indirect Impacts – When considering the "reasonably foreseeable development scenario," impacts could occur to existing utility rights-of-way and roads if all or some areas are opened for geothermal exploration and leasing. Existing rights-of-way could need to be relocated to accommodate development of the resources. Granting of new rights-of-way for non-geothermal development would need to take into consideration existing geothermal leases. No other impacts to land use or realty are expected to occur.	Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Recreation	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," impacts to recreation activities in the assessment area are likely to be minimal. After completion of the construction phase geothermal development is not expected to diminish any of the mentioned recreation activities. Any development near Trego Hot Springs could adversely affect recreation experiences for thousands of visitors each year.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Visual Resources	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," indirect impacts would probably not meet the criteria of VRM Class II areas. The impacts in Class III areas would probably range from severe to light, depending on the amount of development and the proximity to high-use areas. Indirect impacts in Class IV areas could be relatively minor. Potential adverse impacts to visual resources from long-term developments and facilities, such as power lines and communication sites, would be characterized in a site-specific EA and mitigated on a case-by-case basis to minimize impacts to visual resources. Mitigation measures would beneficially impact all landscapes and serve to protect the expansive scenic vistas. Depending upon the type of development lease approved, those developments that would abut the National Conservation Area, wilderness, and wilderness study areas could have an impact on the visual resources of those protected areas.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

Proposed Action	No Action Alternative
Wildlife, Migratory Birds, and Fisheries	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," there are no significant environmental impacts concerning wildlife, migrating birds, or fisheries. Using an updated EA as the guideline for new leases would more adequately provide the level of protection required to ensure that these biological resources are protected under current Federal and State statutes.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Threatened, Endangered, and Special Status Species	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," there are no significant environmental impacts concerning threatened, endangered, and special status species. Using an updated EA and stipulations as the guideline for new leases would more adequately provide the level of protection required to ensure that these species are protected under current Federal and State statutes.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Wild Horses and Burros	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," there are no problematic environmental impacts concerning wild horses and burros under the Proposed Action. Using an updated EA as the guideline for new leases would more adequately provide the level of protection required to ensure that these biological resources are protected under current Federal and State statutes.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Geology and Minerals	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," impacts to geology, mineral, and geothermal resources, expected	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated

Proposed Action	No Action Alternative
from leasing would be minimal. Updated stipulations and mitigation measures would be developed, after additional NEPA analysis has been completed, for each lease application.	mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
National Conservation Area, Wilderness, and Wilderness Study Areas	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," there would be no impacts to the NCA under the Proposed Action Alternative. One PVA borders the NCA, but due to the distance of the proposed lease the impacts would not be significant. Site-specific EAs would be required before any action is undertaken when leases are granted under this plan. There could be potential impacts to the Wilderness Areas—two PVAs border the Black Rock Desert Wilderness Area and two lease applications are pending. PVA 3 borders the wilderness and is adjacent to two pending applications in the northwest of the wilderness. PVA 4 is to the southeast of the wilderness and surrounds McFarlin's Bathhouse Spring. Development could impact the wilderness characteristics set forth in the Wilderness Act. Additional EAs should be conducted investigating the proposed development before permits are granted. There would be no impacts to the WSAs. There is the possibility of cumulative impacts, which would be discussed at the end of the section.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Range Resources	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," the impacts to Range Resources would be addressed in site-specific EAs tiering off this programmatic EA. As such, environmental and range concerns would be addressed on a more intimate level taking into consideration the placement of equipment and roads that would create the least disturbance. Mitigation measures would be addressed in individual EAs as is appropriate to each lease granted.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Cultural Resources	
Direct Impacts – There would be no direct impacts as a result of the proposed action.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Proposed Action	No Action Alternative
Indirect Impacts – Most impacts to cultural resources under the "reasonably foreseeable development scenario" would be prevented through the Section 106 process of the National Historic Preservation Act and no surface occupancy stipulations for National Register listed and National Register eligible sites.	Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Native American Consultation	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," it is not always possible to mitigate the impacts to Traditional Cultural Properties. Geothermal development in the New York Canyon KGRA, PVA 12, and the North and south leases in PVA 12 have the potential to impact Traditional Cultural Properties (TCPs) in the Stillwater Range. The setting of these TCPs could also be impacted. If the flow or temperature of hot springs is affected by geothermal drilling or development, hot springs which are considered sacred by Native Americans could be impacted.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Hazardous Materials/Waste and Solid Waste	
Direct Impacts – There are no direct impacts from issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – When considering the "reasonably foreseeable development scenario," impacts would be insignificant if the substances described in section 3.17.2 are properly handled, stored, and disposed. Proper management of these substances according to Federal and State regulations would ensure that no contamination of soil, groundwater, or surface water would occur with any adverse effects on wildlife, worker health and safety, or surrounding communities. Proper management (in accordance with Federal (RCRA, SARA, SWDA, OSHA, EPCRA, etc.) and State regulations) of these substances would ensure no contamination of soil, groundwater, and surface water, which could also have an impact on wildlife, worker health and safety, and the surrounding community. Under this alternative an updated EA would permit inclusion of updated stipulations, mitigation measures, and/or performance standards specific to each lease that would ensure the long-term health of the area's environmental quality.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

Proposed Action	No Action Alternative
Socio-Economics and Environmental Justice	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Future geothermal exploration, development, production, and close-out activities in the "reasonable foreseeable development scenario" could be seen to provide moderately beneficial impacts to the county economies in the terms of jobs, income, and tax revenues. No adverse impacts are identified.	Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.
Environmental Justice	
No direct or indirect impacts	No direct or indirect impacts
Paleontology	
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities. Indirect Impacts – The indirect impacts are represented in the "reasonably foreseeable development scenario" are outlined in Section 3.20	Direct Impacts – There would be no direct impacts to paleontological or paleoenvironmental resources. Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

1.0 PURPOSE AND NEED OF THE PROPOSED ACTION

1.1 INTRODUCTION

The Bureau of Land Management (BLM), Winnemucca Field Office (WFO) has prepared this Programmatic Environmental Assessment (PEA) to analyze impacts to the human and natural environment from leasing geothermal resources.

Geothermal resources are hot water systems and occur where deep groundwater comes in contact with rock formations that are heated by a deep-seated heat source such as magma. The water serves as a medium by which the heat is transferred toward the Earth's surface. Hydrothermal minerals deposited in the rock pore spaces can create an impermeable cap rock, forming underground geothermal reservoir hot water trapped within rock formations. Where there is an opening in the rock cap, the heat and pressure causes the water to move towards the Earth's surface along fault lines. The hot water cools as it ascends along the fault, and discharges at the surface to form low to moderate temperature hot springs. Where hotter fluids reach the surface (i.e. Yellowstone National Park), fumaroles,[1] geysers, or boiling mud pots occur.

Mile-or-more-deep wells can be drilled into underground reservoirs to tap steam and very hot water. This geothermal energy would be used to turn the turbines that drive electric power generators. There are three types of electrical power generating plants operating today: dry steam plants (which use direct geothermal steam to turn turbines), flash steam plants (which pull deep, high-pressure hot water into lower-pressure tanks and use the resulting flashed steam to drive turbines), and binary-cycle plants (which pass moderately hot water by a secondary fluid with a much lower boiling point) this causes the secondary fluid to flash to steam, which then drives the turbines.

Direct use hot water near Earth's surface that is too cool for electrical power generation can be piped directly into facilities and used for other useful purposes such as: heating swimming pools and spas, heating buildings, growing plants in greenhouses, dehydrating vegetables, heating water for fish farming, and heating soil for crop production at cool-climate latitudes.

For more information on geothermal resources and energy development, visit the following Internet web sites:

www.eren.doe.gov/RE/geothermal.html
www.ngdc.noaa.gov/seg/geotherm.shtml
www.smu.edu/geothermal
www.geothermal.org

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[1] A hole in a volcanic area from which hot smoke and gases escape.

1.2 Location of Proposed Action

The proposed action is located in a defined assessment area within the lands managed by the BLM WFO and the Dixie Valley Known Geothermal Resource Area (KGRA) located within the Carson City Field Office (CCFO) boundary (see Figure 2-1; for greater detail refer to Appendix A). The area is further divided into seven hydrographic regions:

- Northwest Region Hydrologic Basin[2]
- Black Rock Desert Region Hydrologic Basin
- Carson River Basin
- Humboldt River Hydrologic Basin
- West Central Region Hydrologic Basin
- Truckee Basin
- Central Region Hydrologic Basin

Assessment Area

Within the assessment area there are three categories of leasable lands: Prospectively Valuable Areas (PVAs)(also referred to as "Potentially Valuable Areas"), KGRAs (competitive leases), and pending lease application sites (noncompetitive leases)(for pending lease applications, see Appendix H).

Lands not included for leasing consideration and therefore not assessed under this action are any lands within Wilderness Areas, Wilderness Study Areas (WSAs), Areas of Critical Environmental Concern (ACECs), or National Conservation Areas. Also excluded are tribal lands, wildlife refuges, and private land with titles that include geothermal mineral rights.

1.3 History of Geothermal Leasing by the Winnemucca Field Office

Geothermal leasing activity within the WFO peaked in the early to mid 1980s. Since then, leasing activity for geothermal resources has been relatively slow until the California energy crisis surfaced in 2000. Approximately 60 geothermal lease applications have been received in the past two years. In 2001, 16 lease applications were processed for low environmentally sensitive areas. There are currently 53 geothermal leases, 3 power plants, and 2 vegetable dehydration plants in operation within the WFO administrative boundary. The power plants are located at Brady Hot Springs, Desert Peak, and San Emidio Desert and range in generation capacity from 5.8 to 24 megawatts. The dehydration plants are located at Brady Hot Springs and San Emidio Desert. A 12-megawatt power plant is anticipated to be in production soon at the Rye Patch KGRA. Within the Dixie Valley KGRA, there is one geothermal power plant in operation.

Developing geothermal resources on BLM administered public lands involves four phases; leasing, exploration, development/operation and close-out. The first phase is to issue a lease.

[2] A Basin is defined as a geographic area drained by a single major stream or an area consisting of a drainage system comprised of streams and often natural or man-made lakes. Also referred to as Drainage Basin, Watershed, or Hydrographic Region. The U.S. Geological Survey and the Nevada Division of Water Resources, Department of Conservation and Natural Resources, have divided the state into discrete hydrologic units for water planning and management purposes.

Leasing of geothermal resources confers an implied right to the lessee to explore and or develop the geothermal resource. The act of leasing does not directly result in surface disturbance activities, however ground disturbance would occur during the second phase, exploration and phase three, development. Phase four, close-out, would involve removing facilities and reclaiming the site. The BLM would require a separate site-specific National Environmental Policy Act (NEPA)[3] analysis for exploration, development/operation, and close-out phases.

Geothermal leases are usually issued for a ten-year period. Once a geothermal resource is developed within the lease area, the lease allows the lessee use of the resource for up to 40 years. Leases are issued through a competitive or non-competitive process. Competitive leases are offered through a bid process in areas identified as KGRAs. Non-competitive leases are issued for areas outside of KGRAs. Most lease applications are for a minimum of 640 acres. The BLM WFO has approximately 48 pending lease applications. BLM leasing authority is in accordance with the Geothermal Steam Act of 1970[4] and associated regulations 43 Code of Federal Regulations (CFR) part 3200.

1.4 PURPOSE AND NEED

1.4.1 Purpose of the Proposed Action

In May 2001, the President adopted a National Energy Policy, to respond to our Nation's increasing energy needs. This policy recognizes the importance of how the federal government can affect the supply and use of energy. In response to the policy, the BLM developed an implementation strategy titled: *BLM Implementation of the National Energy Policy*. This plan identified a number of tasks that would streamline energy development on public lands. BLM, Nevada has received numerous applications to lease public lands for geothermal resources. A large number of these lease applications are located within the administrative boundary of the WFO.

To expedite processing of these pending lease applications and meet the intent of the National Energy Policy, the BLM WFO has prepared this geothermal PEA to satisfy requirements of the NEPA and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA[5], and to update the Winnemucca District Regional Geothermal EA for lands identified within the assessment areas.

1.4.2 Need for the Proposed Action

This action is pursuant to the National Energy Policy, Executive Order 13212, the BLM Implementation of the National Energy Policy, and to satisfy requirements of the Geothermal Steam Act of 1970 (30 U.S. Code (USC) §1001 et seq. as amended), and geothermal leasing regulations (43 CFR §3200) in order to meet the nation's increasing demand for energy.

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[3] National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190 as amended (42 USC §4321 *et seq.*))
[4] Geothermal Steam Act of 1970 (30 USC §1001 *et seq.* as amended)
[5] 40 CFR §§1500-1508

1.5 DECISIONS TO BE MADE

In accordance with NEPA and the CEQ implementation regulations, and the geothermal leasing regulations (43 CFR 3200), the BLM has prepared this PEA for leasing all or some of the geothermal resources. The purpose of the PEA is to: 1) provide a broad scope analysis addressing the potential cumulative impacts of reasonably foreseeable geothermal development scenarios, 2) consider alternatives in the decision-making process, 3) determine whether a more detailed Environmental Impact Statement (EIS) is required, and 4) develop new stipulations and restrictions for new lease agreements. The decision would be implemented in the form of lease stipulations, lease notices, and conditions of approval for all new geothermal leases. The decision could also defer leasing geothermal resources in some areas. At the conclusion of the PEA process (unless sooner determined), the BLM must determine if the proposed action would cause significant environmental impacts. If not, then a Finding of No Significant Impact (FONSI) would be prepared. If it is determined that the proposed action would cause significant adverse environmental impacts, then the BLM would release a Notice of Intent (NOI) to prepare an EIS.

1.6 ISSUES

The BLM initiated a 30-day public scoping period from May 15, 2002 to June 14, 2002. In addition, two public scoping meetings were held on May 29, 2002 in Winnemucca, Nevada and May 30, 2002 in Lovelock, Nevada. Issues identified through public scoping and internal BLM staff review include the following;

Lands and Realty. Leasing creates a valid existing right, which could affect other future land-use authorizations.

Recreation. Soaking and swimming in natural hot spring pools is a popular recreation activity. Concerns of hot spring users include destruction or degradation of the hot springs. They do not want to be restricted or denied access to hot spring areas. Some believe that hot springs are spiritual places with healing powers.

Visual Resources. Visual resources could be adversely impacted by exploration or development phases. These phases could cause visual intrusions that adversely affect the setting of historic emigrant trails and other sensitive visual resource areas through the construction of roads, wells, ponds, power plants, warehouses, pipelines, and ancillary facilities.

Wildlife. Loss of habitat from reasonably foreseeable development scenarios could adversely impact sage grouse, big horn sheep, mule deer, and antelope populations.

Sensitive Species. Hot spring surface features include pools, mineral deposits, outflows, and other unique habitat features. Loss of habitat from reasonably foreseeable development scenarios could adversely impact sensitive plant and wildlife species.

Wild Horses and Burros. Wild horses and burros could be adversely impacted through displacement, habitat loss, and human disturbance, as well as decreased water supply/sources.

Cultural Resources. Exploration or development phases could also destroy cultural resources or National Register Eligible sites through indirect impacts caused from construction of facilities and removal of vegetation, which could damage or expose previously hidden cultural resources.

Native American. Native American Religious concerns include loss or destruction of surface hot springs, which have spiritual importance or are areas of traditional uses such as healing, and loss or destruction of culturally significant sites.

1.7 RELATIONSHIP TO BLM AND NON-BLM POLICIES, PLANS, AND PROGRAMS

1.7.1 Land Use Conformance Statement

The proposed action and alternative are in conformance with the Paradise-Denio and Sonoma-Gerlach Management Framework Plans (MFPs), and are consistent with Federal, State and local laws, regulations, and plans to the maximum extent possible. Objective M-5 of the Sonoma-Gerlach MFP states, "Make energy resources available on all public lands and other lands containing federally owned minerals." Objective M-6 of the Paradise-Denio MFP states, "Make energy available on all public lands, on a managed and controlled basis, consistent with national energy policies and demands." Lands within the WFO administrative boundary are open for geothermal leasing subject to certain restrictions and stipulations as defined in the associated MFP decisions. Applicable existing and new stipulations are attached as part of this PEA (see Appendix G).

1.7.2 Permits and Authorizing Actions

Prior to implementing exploration or development activities, the lessee must secure additional permits or modify existing permits from BLM (see Table 1-1). Other Federal, State, and local permits would be required prior to each phase of the reasonably foreseeable development scenario. A site-specific NEPA analysis would be required for all BLM permits.

TABLE 1-1
BLM PERMITS AND AUTHORIZING ACTIONS

Authorizing Action	Regulatory Agency
Issue Lease	DOI – BLM
Reasonable Foreseeable Development Scenarios • Exploration Permits (Exploration Operations Permit and Application for Permit to Drill (APD) • Permit for Development and Production (Plan of Utilization)	DOI – BLM

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This chapter describes the proposed action and alternatives (potential actions) to the proposed action for leasing geothermal resources on public lands.

2.1 PROPOSED ACTION

The Nevada BLM is considering leasing geothermal resources on public lands within the WFO administrative boundary and within the Dixie Valley KGRA (the Dixie Valley KGRA is administered by the BLM CCFO). Leasing would comply with the Winnemucca BLM Paradise-Denio, Sonoma-Gerlach MFPs and the Consolidated Resource Management Plan (CRMP) for the Carson City Field Office. Lease applications located within the Black Rock Desert – High Rock Canyon Emigrant Trail National Conservation Area (NCA), tribal lands, wildlife refuges, ACECs, and wilderness or wilderness study areas are not being considered.

The proposed action is to consider leasing all or some of the geothermal resources within PVAs, KGRAs, and pending lease sites as identified in Figure 2-1 (for greater detail, refer to Appendix A). All pending and future geothermal resource leases within these assessment areas would be subject to stipulations, mitigation measures, or performance standards developed from this analysis. Future lease applications would require a cultural resources inventory, and wildlife and sensitive and threatened and endangered species surveys within the WFO administrative boundary prior to leasing. Existing leases or other valid existing geothermal rights within the assessment area would not be subject to the stipulations, mitigation measures, or performance standards developed in this analysis; however, they would be subject to the above should the leases be dropped and leased again.

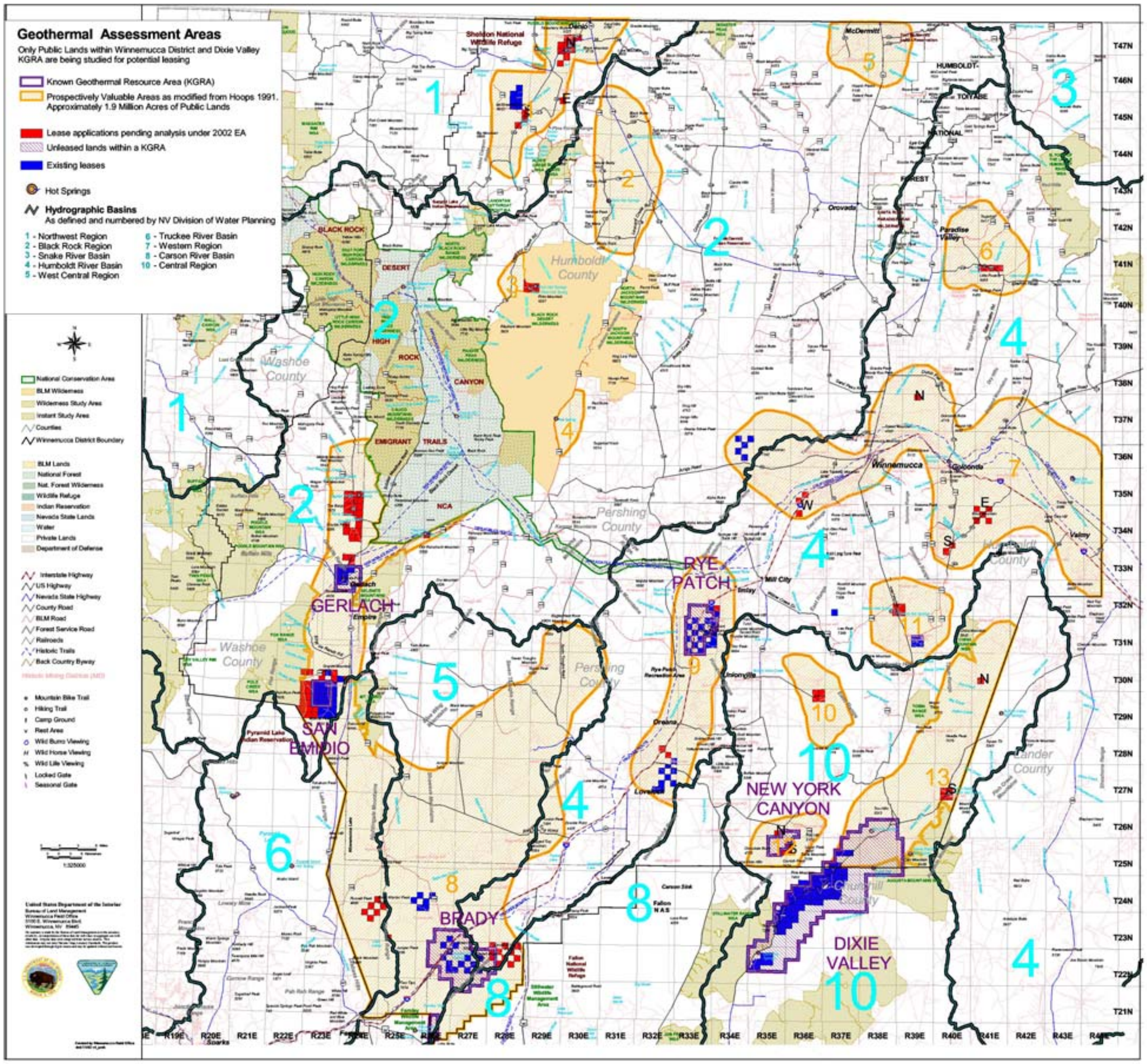
2.2 ALTERNATIVE TO THE PROPOSED ACTION

2.2.1 No Action Alternative

Under this alternative, all or some of the future leases for geothermal resources would be analyzed using the currently approved geothermal EA, *Winnemucca District Regional Geothermal/Oil and Gas Leasing Environmental Assessment (EA-NV-020-2-38), N-11821, June 1982* and policy guidelines titled: *Stipulations for Oil and Gas and Geothermal Leases, Winnemucca Office Instruction Memorandum No. 84-160 (3/84).* The No Action Alternative would be consistent with existing land use plans for the BLM WFO and CCFO. Processing leases under the No Action Alternative would require a supplemental NEPA analysis.

Note: For a comparison between the Proposed Action and No Action Alternatives, refer to Table 2-1.

FIGURE 2-1
WINNEMUCCA FIELD OFFICE ASSESSMENT AREAS



Note: For greater detail, click here (19.6 MB) or refer to Appendix A (9.8 MB) for smaller sectional maps.

2.2.2 Alternative Considered but Eliminated from Detailed Analysis

No Lease Alternative

The No Lease Alternative would not allow leasing of any geothermal resources within the WFO administrative boundary and the KGRA within the CCFO administrative boundary. Under this alternative, all pending and future geothermal lease applications would not be approved so as to preclude any and all environmental consequences. This alternative would not comply with the WFO MFPs and the CRMP applicable to the CCFO; these plans allow for leasing for geothermal resources except in certain identified areas. This alternative would also be inconsistent with the President's National Energy Policy and Executive Order 13212. Consequently, the No Lease Alternative was not carried forward in this analysis.

TABLE 2-1
COMPARISON OF ALTERNATIVES

Purpose and Need Indicators	Output	
	No Action Alternative	**Proposed Action**
Conformance with the Sonoma-Gerlach and Paradise-Denio Management Framework Plans	X	X
Conformance with the Carson City Consolidate Land Use Plan (Dixie Valley KGRA only)		X
No surface occupancy stipulations apply to the following:		
Visible remnants of the Applegate-Lassen Trail from Rye Patch Reservoir to the Western Pacific Railroad near Trego	X	X
Sage grouse strutting grounds	X	X
S-1 cultural sites (National Historic Register Eligible sites)	X	X
George Lund Petrified Forest	X	X
Soldier Meadows Desert Dace ACEC	X	X
The following will be leased with special stipulations:		
West arm of the Black Rock Playa	X	X
Critical wildlife habitats	X	X
New/revised lease stipulations		X
Updated EA to comply with current NEPA requirements, CEQ regulations, and BLM policy		
Migratory Birds		X
Invasive non-native species	Partial	X
Socio-Economic and Environmental Justice		X
Wilderness/WSA		X
Native American religious concerns	Partial	X
Threatened and endangered species – wildlife		X
Sage grouse	Partial	X
Cumulative Impacts	Partial	X

2.2.3 Reasonably Foreseeable Development Scenarios

Although the process of leasing geothermal resources does not directly impact the human environment, future or reasonably foreseeable future development scenarios would result in surface disturbance to some of the lands post-leasing. The reasonably foreseeable development scenarios disclose indirect future or potential impacts that could occur once the lands are leased. The BLM would require a site-specific environmental analysis at the exploration and development stages in order to comply with NEPA.

Four separate and sequential phases of geothermal development could occur. The probable sequence and degree of environmental impact would be contingent upon the success or failure of each preceding phase. The four phases are exploration, development, production, and close-out.

Exploration. This stage includes all activities to explore for geothermal resources. The discrete actions or identifiable actions, which in the aggregate comprise this stage, include geologic, geochemical, and geophysical surveys. Cross-country vehicle travel could occur in order to complete the surveys. After the surveys have been completed, road building and drill pad construction could occur in order to drill temperature gradient and exploration wells.

Geologic, Geochemical, and Geophysical Surveys. These surveys consist of analyzing the surface geology and collecting water samples from hot springs. Based on the geologic and geochemical analysis, inference could be made as to where higher temperature gradients could occur. This work usually covers a broad surface area. Typically, geologic and geochemical surveys cause minimal surface disturbance.

Drilling Temperature Gradient Wells. The next step in exploration is to confirm where higher temperature gradients occur—this is done by drilling temperature gradient wells. These wells are narrow in diameter and are drilled to depths of several hundred to several thousand feet and include road building and drill pad construction. When completed, the operator lowers a thermistor down the well to measure how much the temperature gradient increases with depth. An operator could not produce any fluids out of, or inject any fluids into a temperature gradient well.

Drilling Exploration Wells. After the exploration data has been evaluated, one or more exploration wells could be drilled to a depth of several hundred to several thousand feet, in order to test the prospect. These wells could be flow tested. Each well could disturb approximately one acre. A new road could be constructed into the site.

An operator could drill several gradient wells on a lease to determine the extent of the temperature anomaly and where the highest temperature gradient occurs. Well pads are about .07 acres (55 feet by 55 feet) in size. Typically these wells are located adjacent to existing roads; however, new road construction could be necessary.

Development. This could include the development of a geothermal electric generating plant, direct use facilities, such as green houses or dehydration plants, or a combination of the two. At this stage is where most of the intense activities occur. The producing limits of the field(s) are determined by developmental drilling. Because of the intense drilling at this time, more surface disturbance to construct roads and drill pads would occur. Drilling of production wells would be initiated. Other facilities that would be constructed include pipelines, power plants, electric transmission line construction, greenhouses, dehydration plants, cooling ponds, and warehouse and maintenance facilities. Generally, prior to initiating development scenarios, geothermal developers secure contracts with power companies that allow connection to local electrical grids.

Road Construction. Often new access roads to well pad sites must be built. These roads are usually a half-mile to three miles in length.

Drill Site Construction. Compared to exploration drilling, a well pad for a production well is usually much larger, approximately two acres (300 feet by 300 feet) in size. The number of wells drilled depends on the geothermal resource available. In general, one or two production wells would be drilled.

Geothermal Pipelines. Geothermal pipelines are usually 24-36 inches in diameter and covered with insulation, and would parallel the access road when possible and could be one to four miles in length.

Power Plant and/or Direct-Use Facility Construction. Electrical generation plants would range in generating capacity from 3–25 megawatts. The plant and other required facilities would occupy up to 30 acres. Direct use facilities could include construction of greenhouses or vegetable dehydration plants and other facilities such as cooling ponds. These facilities could occupy up to 5–30 acres.

Electric Transmission Line Construction. Electric transmission lines could range in length from 5-50 miles. They would most likely be supported by wooden poles. Typically a substation also is required to be constructed in conjunction with electrical transmission lines.

Miscellaneous Support Facilities. These facilities could include communications, septic systems, fresh water distribution, cooling towers, etc.

Production. The production stage involves the continued operation and maintenance of the field(s) and includes: new drill sites, maintenance of existing facilities, waste disposal, and geothermal energy production.

Close-Out. The close-out stage involves abandonment after production ceases and includes the following discrete operations: surface equipment removal, capping and cementing drill holes and wells, and surface rehabilitation. All surface disturbances must be reclaimed to BLM standards. Reclamation includes removing all facilities, and re-grading and re-contouring all surface disturbances to blend with the surrounding topography and seeded.

2.3 REASONABLY FORESEEABLE DEVELOPMENT SCENARIO GENERAL ASSUMPTIONS

For the purpose of this analysis, it is assumed that five, 15-megawatt power plants would be developed within the assessment areas.

2.3.1 Surface Disturbance

Exploration. During the exploration stage, surface disturbance is minimal with few adverse impacts until the decision is made to drill one or more exploration wells. An exploration-drilling model is shown below which lists the maximum degree of surface disturbance expected during this phase. This and other models, which follow, tend to maximize the degree of surface disturbance that could occur.

Up to three temperature gradient and/or exploration wells could be drilled on each lease. This would disturb up to approximately three acres. Three new access roads, each a half-mile in length would disturb approximately 1.5 acres. Total disturbance per lease is approximately 4.5 acres (see Table 2-2).

TABLE 2-2
ASSUMPTION REGARDING SURFACE DISTURBANCE
FOR GEOTHERMAL EXPLORATION

Activity	Area Of Disturbance (Acres)
Exploration Roads	Approximately 1 acre/mile
Shallow Temperature Gradient or Exploration (several 100 to several 1000 feet deep)	Approximately 1 acre/drill site

Development. The following model illustrates construction activities required to develop five, 15-megawatt electrical power generating plants, associated wells, pipelines, roads, and electrical transmission lines. The number of wells includes those used for production, standby, and re-injection. Since development is likely to occur in about 5-megawatt increments over a period of several years, the degree of surface disturbance at any given time is less than assumed in the model. Mitigation and enhancement would have occurred in some portions of the lease before additional portions of the lease are developed.

Up to six production or injection wells could be drilled on each lease. Each well pad would disturb approximately 5 acres, and a mainline road would disturb approximately 10 acres. Each of three pipelines would disturb approximately 5 acres and each of three access roads would disturb approximately 7 acres. A power plant would occupy approximately 30 acres, a disposal pond would disturb approximately 5 acres, and a 25-mile transmission line would disturb approximately 10 acres. Total surface disturbance for each plant for this phase of operation would total approximately 121 acres (see Table 2-3).

TABLE 2-3
SURFACE DISTURBANCE EXPECTED TO RESULT
FROM DEVELOPMENT OF FIVE, 15-MEGAWATT POWER PLANTS

Feature	Features/Plant	Disturbed Acres/Feature	Total Disturbed Acres
Power Plant	1	30	150
Well	6	5	150
Cooling Ponds	1	5	25
Pipelines	3	5	75
Access Road (spurs)	3	7	105
Mainline Road	1	10	50
Transmission Line	1	10	50
TOTAL			605

The time frames for a typical geothermal project are estimated as follows.

Exploration: 1 to 5 years
Development: 2 to 10 years
Production: 10 to 30 years (depending on the time required in the construction of geothermal power producing facilities)

Until actual geothermal exploration and development begin, it is difficult to quantify the resource potential and possible future intensified production measures necessary to develop the resources. In order to assess environmental impacts resulting from an action as general as geothermal exploration, development, and production, it is necessary to assume given levels of intensities of such development.

Several models were assumed which describe the major processes and actions involved in the various stages of lease implementation. These models serve as the baseline against which to analyze impacts on the existing environment.

2.3.2 Geothermal Fluid Production and Associated Waste Production

Geothermal fluid production and associated waste production is likely to occur for short periods as wells are tested to determine reservoir characteristics. If geothermal fluids are discovered in commercial quantities, development of the geothermal field is likely.

The rate of fluid production from a geothermal reservoir is unknown until the development-testing phase is completed. During the initial stages of testing, one well is likely to be tested at a time. If testing is successful and the well and reservoir are sufficient for development, wellheads, valves, and control equipment would be built on top of the well casing.

Using data from other areas of geothermal development, it appears that production of geothermal fluids could be expected to vary from 1-6 million gallons per day, per well. Assuming 5 million gallons per day, per well as an average production figure, a lease with two producing wells would produce 10 million gallons of fluid per day.

Most geothermal fluids produced are re-injected back into the geothermal reservoir, via re-injection wells. In flash steam facilities about 15-20 percent of the fluid would be lost due to flashing to steam and evaporation through cooling towers and ponds. Binary power plants[6] are non-consumptive and utilize a closed loop system. Fluids could also be lost due to pipeline failures or surface discharge for monitoring/testing the geothermal reservoir.

[6] In binary power plants, the hot geothermal fluid is used to heat a separate, binary fluid in a heat transfer process. The binary fluid flashes at a lower temperature and is used to turn the power generating turbines.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

Under NEPA, the analysis of environmental conditions is directly related to the expected environmental effects of the proposed alternatives. NEPA requires that the analysis address those areas and the components of the environment with the potential to be affected by the proposed action; locations and resources with no potential to be affected need not be analyzed. The environment includes all areas and lands that might be affected, as well as the natural, cultural, and socioeconomic resources they contain or support.

Affected Environment

In the environmental analysis and scoping process, BLM managers (with input from the public) identified the resources to be analyzed and the level of environmental analysis for each resource. For this proposal, the BLM has examined 18 environmental resources within the boundaries of the WFO, and the Dixie Valley (managed by the CCFO). The three areas within these boundaries that were evaluated were the PVAs, KGRAs, and pending lease areas.

Environmental Impacts

The environmental impacts sections overlay the project elements described in Chapter 2 (the Proposed Action, No Action Alternative, and “reasonably foreseeable development scenario”) onto the baseline of existing conditions outlined in the affected environment. This method outlines the potential environmental impacts of the Proposed Action and No Action Alternative.

Stipulations

Stipulations are defined as conditions of approval, standard operating procedures, and/or mitigation measures, which become part of the BLM’s authorization. Stipulations are listed by resource in Appendix G.

Critical Elements of the Human Environment

Critical elements of the human environment are subject to requirements specified in statute, regulation, or executive order (see Table 3.0-1). Those that are present are considered in this PEA; those that are neither present nor affected are not.

TABLE 3.0-1
CRITICAL ELEMENTS OF THE HUMAN ENVIRONMENT

CRITICAL ELEMENT	GOVERNING FEDERAL STATUTES	PRESENT/ AFFECTED	NOT PRESENT/ AFFECTED
Air Quality	• Clean Air Act of 1970 (42 USC §7401; 40 CFR Parts 51 and 93) as amended	X	
Areas of Critical Environmental Concern	• Federal Land Policy Management Act (FLPMA) of 1976 (P.L. 94-579 (43 USC §1701)(36 CFR §2310.1-2; 1600 Series))		X
Cultural Resources	• American Antiquities Act of 1906 (16 USC §§431-433; 36 CFR §79) • Historic Sties, Buildings, and Antiquities Act of 1935 (16 USC §461 *et seq.*) • Archeological and Historic Preservation Act of 1960 (P.L. 86-523 as amended by P.L. 93-291) • Reservoir Salvage Act of 1960 (P.L. 86-523 as amended; 36 CFR §79) • National Historic Preservation Act of 1966 (P.L. 89-655 (16 USC §470)(36 CFR §§79 and 800)) • Archeological Resources Protection Act of 1979 (P.L. 96-95 (16 USC §§470aa-470ii; 36CFR §79)) • National Historic Preservation Act Amendments of 1980 (P.L. 96-515) • Native American Greaves Protection and Repatriation Act of 1990 (P.L. 101-601 (25 USC §§3001-3013)) • E.O. 11593 (Cultural Resources)	X	
Environmental Justice	• E.O. 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations)		X
Floodplains	• E.O. 11988 (Floodplain Management)		X
Invasive/Non-Native Species (Noxious Weeds)	• Federal Noxious Weed Act of 1975 (P.L. 93-629 • E.O. 13112 (Invasive Species)	X	

CRITICAL ELEMENT	GOVERNING FEDERAL STATUTES	PRESENT/ AFFECTED	NOT PRESENT/ AFFECTED
Migratory Birds	• Migratory Bird Treaty Act of 1918 and 1972 (16 USC §§703-711; 40 Stat. 755) • Bald Eagle Protection Act of 1940 (16 USC§§668-668d, 54 Stat. 250) as amended • E.O. 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)	X	
Native American Religious Concerns	• American Indian Religious Freedom Act of 1978 (P.L. 95-341 (42 USC §1996)) • E.O. 13007 (Indian Sacred Sites)		
Prime or Unique Farmlands	• Surface Mining Control and Reclamation Act of 1977 (30 USC §1201 *et seq.*) • Farmland Protection Policy Act of 1981 (P.L. 95-514)		X
Threatened, Endangered, and Special Status Species	• Endangered Species Act of 1973 (P.L. 93-205 as amended (16 USC §1531 *et seq.*))	X	
Waste, Hazardous or Solid	• Toxic Substances Control Act of 1976 (15 USC §2601) • Resource Conservation and Recovery Act of 1976 (42 USC §6901 *et seq*.) • Comprehensive Environmental Response, Compensation, and Liability Act 1980 (42 USC §9615) as amended by the Superfund Amendments and Reauthorization Act Title III of 1986 (42 USC §103)	X	
Water Quality	• Water Quality Improvement Act of 1970 (33 USC §26) as amended • Safe Drinking Water Act of 1974 (42 USC §§146; 300f *et seq*.; 1441, *et seq*.; 43 CFR §146) • Soil and Water Resources Conservation Act of 1977 (P.L. 95-192 (16 USC §2001 *et seq.*) • Water Quality Act of 1987 (P.L. 100-4 (33 USC §1251 *et seq.*)) (amended the Federal Water Pollution Control Act of 1970 (the Clean Water Act))	X	

CRITICAL ELEMENT	GOVERNING FEDERAL STATUTES	PRESENT/ AFFECTED	NOT PRESENT/ AFFECTED
Wetlands and Riparian Zones	• Water Quality Act of 1987 (P.L. 100-4 (33 USC §1251 *et seq.*)) (amended the Federal Water Pollution Control Act of 1970 (the Clean Water Act)) • North American Wetlands Conservation Act of 1989 (P.L. 101-233; 16 USC §§4401-4412; 103 Stat 1968) • E.O. 11988 (Floodplain Management) • E.O. 11990 (Protection of Wetlands)	X	
Wild and Scenic Rivers	• National Wild and Scenic Rivers Act of 1968 (P.L. 90-542 (16 USC §1271) as amended)		X
Wilderness	• Wilderness Act of 1964 (16 USC §§1131-1133) • Federal Land Policy Management Act of 1976 (43 USC §1701; 36 CFR §2310.1-2; 1600 Series)	X	

3.1 AIR QUALITY

3.1.1 Affected Environment

In the State of Nevada the airshed boundaries are considered to correspond to those of the hydrographic regions, and are treated as such in this chapter. Nevada airshed boundaries correspond to eight of the hydrographic regions in the Humboldt, Pershing, Churchill, Washoe and Lyon counties.

3.1.1.1 Regional Setting

Lands under consideration for leasing under this action do not include wilderness areas, ACEC, or the Black Rock Desert – High Rock Canyon Emigrant Trails NCA. Also excluded are tribal lands managed by the Bureau of Indian Affairs, the Sheldon National Wildlife Refuge and private lands with titles that include geothermal mineral rights.

Table 3.1-1 groups the KGRAs and PVAs (including the lease application areas) by hydrographic region (airshed) and county, and also lists the ACEC, NCAs and Indian Reservations within each county. The greatest number of KGRAs and PVAs lie within Hydrographic Regions 2 (Black Rock Region), 4 (Humboldt River Basin), and 10 (Central Region), with one PVA in Hydrographic Region 1 (Northwest Region) and one KGRA and a portion of PVA 8 in Hydrographic Region 5 (West Central Region). Portions of PVA 8 fall within Hydrographic Region 6 (Truckee River Basin) and 8 (Carson River Basin).

The purpose of plan requirements, initial air quality classifications, increments, and ceilings for Federal Class I and II areas are described in the Clean Air Act[7] Sections 160 to 169. Class I Federal lands apply to attainment areas and include national parks, national wilderness areas and national monuments which are granted special air quality protection under section 162 (a). In the state of Nevada only the Jarbridge Wilderness Area in the Elko County has been designated as a Class I area. All other attainment areas within Nevada, which have not been designated as Class I areas, are Class II areas.

There are therefore no mandatory Class I Federal areas within any of the eight geothermal assessment areas under consideration. Class 1 areas closest to the geothermal assessment areas are:

- National Park Service Class I areas to the west in California (Lava Beds National Monument, Lassen Volcanic National Park)

- Forest Service Class I Wilderness Areas to the west in California (South Warner Lakes, Caribou, Thousand Lakes), and to the east in Nevada (Jarbridge)

[7] Clean Air Act of 1970 (P.L. 91-604 ((42 USC §7401; 40 CFR Parts 51 and 93) as amended by P.L. 91-631 and P.L. 101-549)

There are no Fish and Wildlife Service Class I units or American Indian Class I lands close by. However, 40 CFR Section 51.307 stipulates that the operator of any new major stationary source or major modification located within 100 kilometers of a Class I area must contact the Federal Land Managers for that area. Of the above mentioned Federal Class I areas, only the South Warner Lakes area is of concern.

TABLE 3.1-1
NATIONAL FORESTS, WILDERNESS AREAS, NATIONAL WILDLIFE REFUGES, NATIONAL MONUMENTS, AND INDIAN RESERVATIONS
(GROUPED BY AIRSHED (HYDROGRAPHIC REGION) AND COUNTY)

Airshed (Hydrographic Region)		County	KGRA	PVA*	National Parks, Wilderness Areas, National Monuments, Indian Reservations within Airshed (Hydrographic region)	Class I Areas**
1	Northwest Region	Humboldt		1	Sheldon National Wildlife Refuge Lahontan Cutthroat Trout Natural Area	South Warner Wilderness
		Washoe				
2	Black Rock Region	Humboldt		2, 3, 4, 5, (7)	Black Rock Desert-High Rock Canyon-Emigrant Trails NCA Humboldt Toiyabe National Forest Summit Lake Indian Reservation Fort McDermitt Indian Reservation	South Warner Wilderness
		Washoe	Gerlach, San Emidio		Pyramid Lake Indian Reservation Black Rock Desert-High Rock Canyon-Emigrant Trails NCA	
		Pershing		(8)		
4	Humboldt River Basin	Humboldt		6, 7	Humboldt Toiyabe National Forest Winnemucca Indian Reservation	
		Pershing	Rye Patch	9, 11, (8)		
		Churchill		(8)		
		Elko				

Airshed (Hydrographic Region)		County	KGRA	PVA*	National Parks, Wilderness Areas, National Monuments, Indian Reservations within Airshed (Hydrographic region)	Class I Areas**
		Lander			Battle Mountain Indian Reservations	
5	West Central Region	Pershing		8		
		Churchill	Brady	(8)		
		Lyon			Fernley Wildlife Management Area	
6	Truckee River Basin	Washoe			Pyramid Lake Indian Reservation Reno-Sparks Indian Reservation	
		Pershing		(8)		
		Storey				
7	Western Region	Washoe				
8	Carson River Basin	Churchill		(8)	Fallon National Wildlife Refuge Stillwater Wildlife Management Area	
		Pershing				
9						
10	Central Region	Pershing	New York Canyon, (Dixie Valley)	10, 12, 13		
		Churchill	Dixie Valley			
		Lander				

* Areas falling partly in a county are shown in parenthesis
** Areas within 100 kilometers of lease application

3.1.1.2 Meteorology and Air Quality

Presently the air quality within the Winnemucca District is good except for periods during late spring, summer, and early fall when particulate concentrations (dust) become excessive. During winter, stagnating air masses called anticyclones often remain over the region for two or more days preventing vertical atmosphere movement and thus causing atmospheric mixing depths to remain shallow. This condition is prevalent over Nevada from November through January. There is also a high frequency of occurrence of light wind speeds from October through January. These phenomena—stagnating anticyclones, shallow atmospheric mixing depths, and light winds—all tend to allow air pollution to accumulate. However, because the area is virtually undeveloped and free of pollution sources, these meteorological conditions cause little impact on the air quality in the area.

Meteorological results from Winnemucca, Valmy and mines in northern Nevada indicate winds of 8-10 miles per hour, with wind directions showing a general bimodal distribution, the primary mode being south southwesterly for the summer months and the secondary mode north northeasterly during the winter. The ground level wind directions in Nevada are locally modified by the southerly to south southwesterly trending mountain ranges and valleys of the "Basin and Range" topography of this region.

None of the lease application areas are located in non-attainment areas for either particulates or ozone (except Washoe County which is in marginal non-attainment for the 1 hour ozone standard). The Class II air quality area located closest to the application sites and PVAs is the Black Rock Desert – High Rock Canyon Emigrant Trails NCA. This action does not involve non-attainment areas, and emissions from the development and production would be negligible, so that it should conform to the State of Nevada Implementation Plan.

Except for particulate concentrations (dust) during certain times of the year, other pollution emission forms are inconsequential within the assessment area. In future years other pollutant sources may become important particularly if industrialization or population increases occur within the area. There is also the possibility of outside emission sources affecting the ambient air quality of the area.

Windborne dust from west-southwesterly winds blowing across the Black Rock Desert in late spring, summer, and early fall causes a degradation of air quality in the region. Reportedly, dust generated in the Black Rock Desert is carried across the State, reaching Elko during severe low-pressure disturbances.

Wildfires or prescribed burning in the area occasionally emit particle matter (smoke) into the air, producing noticeable deterioration of air quality within the area. Subsequently, these areas are exposed to wind erosion, which suspends ash and soil particles in the air.

For the hydrographic regions under consideration, Washoe County (Hydrographic Region 1, 2, 6 and 7) is in marginal non-attainment for ozone (O_3). The other areas have achieved attainment for all six criteria pollutants (carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter-10 microns (PM_{10}), O_3, and sulfur dioxide (SO_2)). Table 3.1-2 shows that

PM_{10} levels measured at various urban State and Local Air Monitoring Station (SLAMS), National Air Monitoring Station (NAMS) and Special Purpose Monitoring Station (SPMS) sites are well within the U.S. Environmental Protection Agency (EPA) standard annual value of 50 $\mu g/m^3$. The rural Interagency Monitoring of Protected Visual Environments (IMPROVE)[8] program monitoring in surrounding counties sites show PM_{10} levels below $10 \mu g/m^3$. It is expected that these levels would not rise significantly during activities within any of the PVAs.

TABLE 3.1-2
PM_{10} LEVELS MEASURED AT URBAN SLAMS, NAMS, AND SPMS SITES

Airshed (Hydrographic Region)		County	Monitoring Site	PM_{10} Level, Annual Average $\mu g/m^3$	Year Sampled
1	Northwest Region	Humboldt			
		Washoe			
2	Black Rock Region	Humboldt			
		Pershing			
		Washoe			
4	Humboldt River Basin	Humboldt			
		Pershing	Lovelock (SPMS/SLAMS)	24	1997
		Churchill			
		Elko			
		Lander	Battle Mountain (SLAMS)	24	1999
5	West Central Region	Pershing			
		Churchill			
		Lyon	Fernley (SPMS)	16	1998
6	Truckee River Basin	Washoe	Sparks (NAMS/SLAMS)	27	2000
			Galletti (NAMS/SLAMS)	42	2000
			Incline (SPMS/SLAMS)	16	2000
			Reno (NAMS/SLAMS/SPMS)	31	2000
			Toll Road (SPMS)	21	2000
			Mustang (SPMS)	16	1997
		Pershing			

8 The IMPROVE program is a cooperative measurement effort governed by representatives from Federal and regional-state organizations. It was established in 1985 to aid the creation of Federal and State implementation plans for the protection of visibility in Class I areas as stipulated in the 1977 amendments to the Clean Air Act.

Airshed (Hydrographic Region)		County	Monitoring Site	PM_{10} Level, Annual Average µg/m³	Year Sampled
		Storey			
7	Western Region	Washoe			
8	Carson River Basin	Churchill			
		Pershing			
9					
10	Central Region	Pershing			
		Churchill			
		Lander			
	Regional Background Sites	White Pine	Great Basin National Park (IMPROVE)	6	2000
		Elko	Jarbidge Wilderness Area (IMPROVE)	8	2000
		Lassen	Lassen Volcanic National Park (IMPROVE)	5	2000

General provisions for preventing of air pollution and for employees' health and safety are included in the leasing and operating regulations. In addition, Federal Air Quality Standards and Nevada Air Quality Regulations are applicable. Lease stipulations and conditions of approval for specific permits are issued to ensure that impacts related to air quality standards and public health and safety do not cause violations during construction and regular operational periods. Post leasing operations would be required to comply with air quality standards and to obtain the necessary permits.

The Clean Air Act requires the EPA to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. The Nevada Division of Environmental Protection, Bureau of Air Quality is charged with maintaining and improving the air quality within the State of Nevada (excluding Washoe and Clark Counties, which have their own jurisdictions) and setting Ambient Air Quality Guidelines. Table 3.1-3 lists the Nevada and Federal Ambient Air Quality Standards.

TABLE 3.1-3
STATE OF NEVADA AND FEDERAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Nevada Standards		National Standards		
		Concentration	Method	Primary	Secondary	Method
Ozone (O_3)	1 hr	235 µg/m^3	Chemoluminescence	235 µg/m^3	235 µg/m^3	Chemoluminescence
Carbon monoxide (CO) <5,000 ft above sea level	8 hrs	10,000 µg/m^3	Nondispersive Infrared	10,000 µg/m^3		Nondispersive Infrared
Carbon monoxide (CO) >5,000 ft above sea level	8 hrs	6,670 µg/m^3	Nondispersive Infrared	10,000 µg/m^3		Nondispersive Infrared
Carbon monoxide (CO) at any elevation	1 hr	40,000 µg/m^3	Nondispersive Infrared	40,000 µg/m^3		Nondispersive Infrared
Nitrogen dioxide (NO_2)	Annual arithmetic mean	100 µg/m^3	Chemoluminescence	100 µg/m^3	100 µg/m^3	Chemoluminescence
Sulfur dioxide (SO_2)	Annual arithmetic mean	80 µg/m^3	Ultraviolet fluorescence	80 µg/m^3		Pararosaniline
Sulfur dioxide (SO_2)	24 hrs	365 µg/m^3	Ultraviolet fluorescence	365 µg/m^3		Pararosaniline
Sulfur dioxide (SO_2)	3 hrs	1,300 µg/m^3	Ultraviolet fluorescence		1,300 µg/m^3	Pararosaniline
Particulate matter PM_{10}	Annual arithmetic mean	50 µg/m^3	High volume PM_{10} sampling	50 µg/m^3	50 µg/m^3	High volume PM_{10} sampling

Pollutant	Averaging Time	Nevada Standards		National Standards		
		Concentration	Method	Primary	Secondary	Method
Particulate matter PM_{10}	24 hrs	150 $\mu g/m^3$	High volume PM_{10} sampling	150 $\mu g/m^3$	150 $\mu g/m^3$	High volume PM_{10} sampling
Particulate matter $PM_{2.5}$	Annual arithmetic mean			15 $\mu g/m^3$	15 $\mu g/m^3$	Low volume $PM_{2.5}$ sampling
Particulate matter $PM_{2.5}$	24 hrs			65 $\mu g/m^3$	65 $\mu g/m^3$	Low volume $PM_{2.5}$ sampling
Lead (Pb)	Quarterly Arithmetic mean	1.5 $\mu g/m^3$	High volume sampling acid extraction and atomic absorption spectrometry	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	High volume sampling acid extraction and atomic absorption spectrometry
Hydrogen sulfide (H_2S)	1 hr	112 $\mu g/m^3$	Cadmium hydroxide extraction method			
Visibility	Observation	In sufficient amount to reduce the prevailing visibility to less than 30 miles when humidity is less than 70 %	Observer or camera			

3.1.2 Environmental Impacts

Air quality can be affected by reasonable and foreseeable exploration and development, by (1) an increase in particulate matter (dust), (2) release of gases and vapors and (3) noise. These are discussed below. These effects would most likely be greatest during the development and close-out phases.

3.1.2.1 Proposed Action

Direct Impacts – There are no direct air quality impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," any impact would be minor in nature and localized to a small area. Under this alternative the mitigation measures and stipulations for future leases would be established using an updated PEA and therefore, more stringent protection measures.

Particulate matter. Dust generated by the movement of exploration and construction vehicles over untreated local roads, and airborne dust resulting from earth moving, drilling activity, construction or wild fires, could add particulate material to the atmosphere. Depending on location, areas that are temporarily denuded of vegetation (e.g., roads, trails, drill pads, etc.) would be subject to a higher degree of wind erosion than normally associated with natural, undisturbed ground. Regolith areas or bare playas once disturbed would become sources of higher localized particulate pollution, particularly during dry periods in the spring and early summer months when low-pressure frontal systems move easterly through the area. Because of increased human activity with this action, a higher incidence of accidental range fires could result throughout the various stages of development. Wild fires can temporarily increase air pollution as well as cause other pronounced long-term resource damage.

A quantitative measurement of potential increases in particulate emissions as a result of this action is not possible since specific plans for operation or production may not be submitted until after leases are issued. The local air quality could be impacted by increased particulate concentrations from exploration, construction, and road composition (i.e., dirt and gravel roads). Mitigating measures should be created in later EAs. Adverse impacts to air quality could be reduced through dust suppression efforts such as applying water to roads and construction sites. A combination of restoration and natural re-vegetation should bring disturbed areas back to their natural condition. Based on the reasonably foreseeable development scenario, total surface disturbance from the proposed action would total approximately 605 acres (see Table 2.2-3). Comparing acreages of surface disturbance and the localized nature of the impacts, any adverse impacts to air quality would be minimal.

Gases. Motor vehicles used to move personnel and off-road construction equipment could contribute a negligible pollution load to the local atmosphere. Non-condensable gases such as carbon dioxide, methane, hydrogen, nitrogen, argon, carbon monoxide, hydrogen sulfide, radon, and ammonia vapors are often associated in varying amounts with geothermal development.

Although emitted in low concentrations, some of these gases could pose pollution problems and health hazards.

Hydrogen sulfide (H_2S), emitted from a well during testing, or from a cooling tower when a power plant is operating, has an unpleasant odor (rotten egg smell) at concentrations as low as 0.04 mg/m^3, but loses its odor at above 40 mg/m^3 and can cause severe eye injury and respiratory paralysis at exposure above 140 mg/m^3. H_2S concentrations must stay within standards to meet safety requirements. Basements, sumps, and trenches where it can accumulate as a result of its density being greater than that of air, should be monitored. It is assumed that during normal operations, all spent geothermal water is to be re-injected. However, with the exploration and testing phases, this may not be the case, and it is suggested that during such operations the H_2S emissions into the ambient atmosphere, as well as in the water be constantly monitored.

Condensed steam from geothermal development could contain contaminants, which if present in high concentrations, could be damaging to plant and animal life, depending upon mode of release. Terrestrial and aquatic animals ingesting natural food contaminated by emission fallout could be adversely affected. However, existing geothermal experience indicates that biotic problems of this nature are generally negligible.

The highest levels of gas and vapor emission would normally occur through venting during test drilling and production. Any accidental discharges during the rupture of pipelines or well blowout would also yield gases and vapors to the atmosphere. Cementing and capping wells during closeout would allow small amounts of gases and vapors to escape to the atmosphere. Overall impacts to air quality would be minor.

Noise. The noise level for any geothermal lease area can be expected to increase as the various phases of activity are implemented. The construction of access roads, test drilling, vehicular movement and other ancillary sound sources tend to raise background noise. Normally these are of relatively short duration and more of a disturbance factor rather than being associated with resource damage. Operations producing the greatest amounts of noise are air drilling, well testing and bleeding. By comparison, noise produced by a fully developed power producing steam field is modest, originating from the occasional venting from wells through mufflers and from pipeline leaks.

Upon closeout, wells are capped and cease to be a source of noise. If present, excessive noise levels can pose a health and safety hazard to nearby workers, are objectionable to area residents or visitors and could disturb wildlife distribution and breeding habits. Although it is presumed that noise could have an adverse impact on wildlife, such impacts should be short-term and minor.

3.1.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.2 SOILS

3.2.1 Affected Environment

The purpose of this section is to identify and describe soils for the entire assessment region and analyze associated impacts to soils. This was accomplished by review of the general soils map and Natural Resources Conservation–Service Soil Survey Geographic (NRCS-SSURGO) database to determine general soil characteristics and erosion potential. Because of the large area involved, in addition to the available data sources, professional judgment and experience were also used in the assessment of impacts to the soils and the potential for soil erosion if the landscape is disturbed.

Soil orders found throughout the region containing the geothermal lease applications PVAs, and KGRAs in the WFO region and Dixie Valley region consist primarily of Entisols, Aridisols, and some Mollisols. These soils are dominantly mineral soils and are highly variable in thickness, texture, rock fragment content, and morphologic and chemical properties. Elevation, geology, climate, vegetation, and landscape position have a strong influence on the distribution of soils in the region.

3.2.1.1 General Soils Found in the Region

Aridisols. Aridisols are soils formed in dry environments that do not have water available to mesophytic plants for long periods (Soil Survey Staff, 1999). These soils may have one or more pedogenic horizons that may have formed under the present climate conditions or may be relicts of formation during former climate regimes. Aridisols are generally light colored, low in organic matter, and may have accumulations of soluble salts and calcium carbonate. Older Aridisols typically have substantial accumulations of calcium carbonate and reddened, clay-rich argillic horizons. The properties of the older Aridisols can make them less pervious to precipitation, more likely to generate surface runoff during precipitation events, and susceptible to erosion by surface runoff. Aridisols form on lake plain terraces, fan piedmonts, and lower mountain slopes.

Entisols. Entisols have little to no evidence of pedogenic horizons. This is primarily because these are the soils that have formed on deposits of very young material. They typically consist of relatively unconsolidated deposits of sand and gravel. In general, Entisols are very low in organic matter. These soils are found in or along active stream washes, in areas of eolian activity, and on various parts of hill slopes.

Mollisols. Mollisols are very dark colored mineral soils, generally with a dark colored surface horizon that is rich in organic matter, and typically are found at higher elevations. Most Mollisols are associated with grass vegetation, and some form under forest cover and generally have well-developed horizonation that includes argillic horizons. Some Mollisols are very old and are relict from former climate and vegetation conditions.

The youngest soils in the region, the Entisols, are those formed in recently deposited sand and gravel as a result of erosion and geomorphic processes that occur in fluvial, eolian, and lacustrine environments. These soils typically have ages from a few years to several hundred years.

Intermediate age soils, which formed in the middle to latest Holocene (< 4,000 years ago), are found in alluvium on wet floodplains. These soils formed in wet flood plains and have been stable long enough to have accumulated organic matter and formed a dark-colored A-horizon. These soils are probably less than 1,000 years old.

Inset alluvial fan, fluvial terraces, bars of beach plains, and pluvial lake plain terraces, may be considerably older and have soil formation commensurate with an age of early to middle Holocene (2,000-10,000 years ago). These Aridisols typically have a cambic B-horizon (a B-horizon that is slightly reddened or has recognizable structure) and may have a very thin surface horizon.

Fan piedmonts are extensive throughout the region. The surfaces on the fan piedmonts are late to mid-late Pleistocene (10,000-130,000 years ago) and have soils that are characteristic of very stable land surfaces to allow strong development. Most of the soils found on the fan piedmonts are low in organic matter.

3.2.1.2 Erosion Hazard for Soils

The susceptibility to erosion, or the erosion hazard, for soil throughout the region varies with geology, parent material, elevation, slope, aspect, vegetation cover, local microclimate, land use, and landscape history. The history and evolution of the landscape and the geomorphic processes occurring in the landscape dictate to a large degree the distribution of ages and types of soils throughout the area. The long-term history of the landscape is most important to the erosion susceptibility of soils formed on moderate to gentle slopes.

Because of the large number and complex spatial distribution of soil units throughout the region, it was only possible to make a general assessment of the erosion hazard. The principal agents affecting soil erosion in the region are primarily water on slopes and wind on the valley floors and slopes, although it is recognized that water associated with ephemeral playa lakes can have an erosional impact on soils. Soil parameters available in the NRCS-SSURGO database for Nevada allow development of erosion hazard groupings. A soil erodibility factor (K factor), slope, wind erodibility index (I), and climate (C factor) were obtained from the NRCS[9] data for the soil groups in the region. This information allows development of a general guide for estimating the erosion hazard for bare soil in Nevada.

[9] U.S. Department of Agriculture, Natural Resources Conservation Service, 2001, National Soil Survey Handbook, title 430-VI.

3.2.1.3 Soil Erosion by Water

For soils eroded by flowing water, the general erosion hazard is divided into three classes: slight, moderate, and high. The hazard is estimated by using the formula: Erosion Hazard = K factor x Slope.

TABLE 3.2-1
EROSION HAZARD VALUES (WATER)

Erosion Hazard	Value
Slight	<4
Moderate	4-8
High	>8

Erosion Hazard: Slight

- Includes soils of all soil texture classes formed on slopes of less than 4 percent
- Includes soils formed on slopes of less than 15 percent for these soil textures: sand, fine sand, loamy sands and coarse sandy loams

Erosion Hazard: Moderate

- Includes soils formed on slopes of 4-15 percent for these soil textures: loam, silt loam, very fine sandy loam, sandy clay loam, clay loam, and clay
- Includes soils formed on slopes of 15-30 percent for these textures: sand, fine sand, loamy sands and coarse sandy loams

Erosion Hazard: High

- Includes soils formed on slopes of 15-30 percent for these textures: loam, silt loam, very fine sandy loam, sandy clay loam, clay loam, and clay
- Includes soils of all other textures formed on slopes greater than 30 percent

3.2.1.4 Soil Erosion by Wind

For soils eroded by wind, the general erosion hazard is also divided into three classes: slight, moderate, and high. The hazard is estimated by the formula: Erosion Hazard = I (wind erodibility index) x C (climatic factor).

TABLE 3.2-2
EROSION HAZARD VALUES (WIND)

Erosion Hazard	Value
Slight	<40
Moderate	40-80
High	>80

Erosion Hazard: Slight

- Includes soils of all texture classes with greater than 35 percent rock fragment
- Includes soils formed on slopes that are greater than 35 percent

Erosion Hazard: Moderate

- Soils having textures of clay, silty clay, silty clay loams, clay loams, silt loam, loam, very fine sandy loam, and sandy loam have a moderate wind erosion hazard

Erosion Hazard: High

- Soils having textures of loamy fine sand, fine sand and sand have a high wind erosion hazard

3.2.1.5 Soil Erosion Related to Landform Type

The general erosion hazard classes above can be grouped within broad classes of landforms (Table 3.2-3). This provides an additional means to assess the potential for erosion caused by impacts related to development of geothermal resources. These landforms represent the major types found in the region that encompasses PVAs, KGRAs, and pending lease applications.

TABLE 3.2-3
ASSOCIATIONS OF LANDFORM TYPE AND ESTIMATE EROSION HAZARDS RELATED TO WATER AND WIND

Landforms	Erosion Hazard	
	Water	Wind
Playa/lake plain	Slight	Moderate
Beach Plain (lake bars)	Slight to moderate	Slight to moderate
Sand sheet	Slight	High
Fan piedmont	Moderate	Slight
Mountains	High	Slight

Existing leases west of Blue Mountain are estimated to have a high wind erosion hazard. Existing and pending leases in the Desert Peak and Cinnabar Hill area have potential for high wind erosion hazard.

3.2.2 Environmental Impacts

3.2.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," geothermal exploration and development activities can be expected to cause disturbance to the landscape and soils. This could include clearing and grading access roads and trails, well sites, pipelines, power lines, and other infrastructure associated with exploration and production. Reclamation would be required following exploration and production activities.

Associated impacts would likely include, but are not limited to:

- Reduced vegetation productivity by removal of topsoil
- Increased compaction
- Increased erosion, both water and wind
- Alter soil chemistry by chemical spills
- Mixing soil horizons can change properties such as infiltration, salinity, alkalinity or texture

The amount of soil erosion would depend on the location of the exploration sites with respect to geology, slope, landform soil association, elevation, and aspect. Off-road vehicle travel could impact exposed soils. Increased runoff from road surfaces would contribute to sediment erosion, possible contamination of streams with excessive sediment that could impair beneficial uses, and contribute to dust emissions.

The following are the potential environmental impacts on soils quality when analyzing the "reasonably foreseeable development scenario."

Exploration. The environmental impacts on soils during the exploration phase is expected to be minor in nature, of a short duration, and localized to a small area.

Development. The greatest environmental impact on soils is expected to occur during the development phase. During this phase development drilling would occur, a mainline road would be constructed, pipelines and access roads would be built, and a power plant and electrical transmission lines constructed. Each of the activities would disturb the soils in the affected areas.

Production. Soil disturbance is expected to be minimal during the production phase. Most, if not all soil disturbances would have already occurred.

Close-out. During the close-out phase, soil disturbance would again reach a peak as production and injection wells are capped, pipelines are dismantled, the power production plant and support facilities would be dismantled, and the electrical transmission line removed. All production materials would be removed from the site and the landscape would be returned to it original grade and condition.

3.2.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.3 HYDROLOGY AND WATER QUALITY

3.3.1 Affected Environment

3.3.1.1 Introduction

The hydrographic basin is the basic management unit used by the Nevada Division of Water Resources (NDWR). Generally, a hydrographic basin is defined by the topographic divide, or ridgeline, that separates adjacent basins. Most basins in the Basin and Range physiographic province are closed; surface waters in the basin originate in adjacent mountains and remain in the valley. In some cases, the boundary between basins may be arbitrarily defined at low divides covered by alluvial sediments. Surface drainage channels link a few of the hydrographic basins within the WFO assessment area; these include the hydrographic basins along the Humboldt River and those adjacent to the Quinn River. Table 3.3-1 identifies the 40 hydrographic basins of the WFO assessment area.

The WFO assessment area is located in the northwest corner of the Great Basin segment of the Basin and Range physiographic province. Topography of the area reflects that typical of the Great Basin in which mountain ranges are generally oriented north-south and intervening valleys are narrow relative to their length. Mountain ranges are typically 5-15 miles wide. Valleys are slightly wider, 10-20 miles (Plume, 1996), and commonly closed. Surface water drainage originates in the mountains and flows to a small lake or playa in the valley. Streams and lakes are typically ephemeral.

TABLE 3.3-1
HYDROGRAPHIC BASINS, PERENNIAL YIELDS, AND COMMITTED RESOURCES WITHIN THE ASSESSMENT AREA

Regions/Basins	Perennial Yield (Acre Feet/Year)	Committed Resources (Acre Feet/Year)
Northwest Region (1)		
1. Pueblo Valley	2,000	5,923
2. Continental Lake Valley	1,000	9,220
3. Gridley Lake Valley	3,000	13,990
4. Virgin Valley	6,000	9
Black Rock Desert Region (2)		
21. Smoke Creek Desert	16,000	6,392
22. San Emidio Desert	2,500	7,440
23. Granite Basin	200	0
24. Hualapai Flat	6,700	32,123

Regions/Basins	Perennial Yield (Acre Feet/Year)	Committed Resources (Acre Feet/Year)
25. High Rock Lake Valley	5,000	3541
26. Mud Meadow	13,000	3,892
27. Summit Lake Valley	1,000	12
28. Black Rock Desert	30,000	23,897
29. Pine Forest Valley	11,00	40,990
28. Black Rock Desert	30,000	23,897
29. Pine Forest Valley	11,000	40,990
30. Kings River Valley	17,000	60,223
31. Desert Valley	9,000	29,597
32. Silver State Valley	5,900	25,273
33. Quinn River Valley	60,000	92,355
Humbolt River Basin (4)		
64. Clovers Area	72,000	35,784
65. Pumpernickel Valley	*	27,756
66. Kelly Creek Area	*	29,647
67. Little Humbolt Valley	34,000	9,155
68. Hardscrabble Area	*	0
69. Paradise Valley	*	105,112
70. Winnemucca Segment	17,000	40,644
71. Grass Valley	13,000	42,938
72. Imlay Area	3,000	7,604
73. Lovelock Valley	45,000	9,358
74. White Plains	100	47
West Central Region (5)		
75. Brady Hot Springs Area	2,500	1,288
77. Fireball Valley	100	0
78. Granite Springs Valley	4,500	784
79. Kumiva Valley	500	2
Truckee Basin (6)		
80. Winnemucca Lake Valley	3,300	262
Carson River Basin (8)		
101A. Packard Valley (Carson Desert)	700	2,621
101. Carson Desert (Packard V)	710R	2,621

Regions/Basins	Perennial Yield (Acre Feet/Year)	Committed Resources (Acre Feet/Year)
Central Region (10)		
128. Dixie Valley	15,000	37,435
129. Buena Vista Valley	10,000	330,456
130. Pleasant Valley	2,600	1,699
131. Buffalo Valley	8,000	8,890
132. Jersey Valley	250	27

* Yield included in values listed above

Source: *Nevada Water Facts, 1992, Nevada Division of Water Planning, Department of Conservation and Natural Resources, Carson City*

3.3.1.2 Surface Water Resources

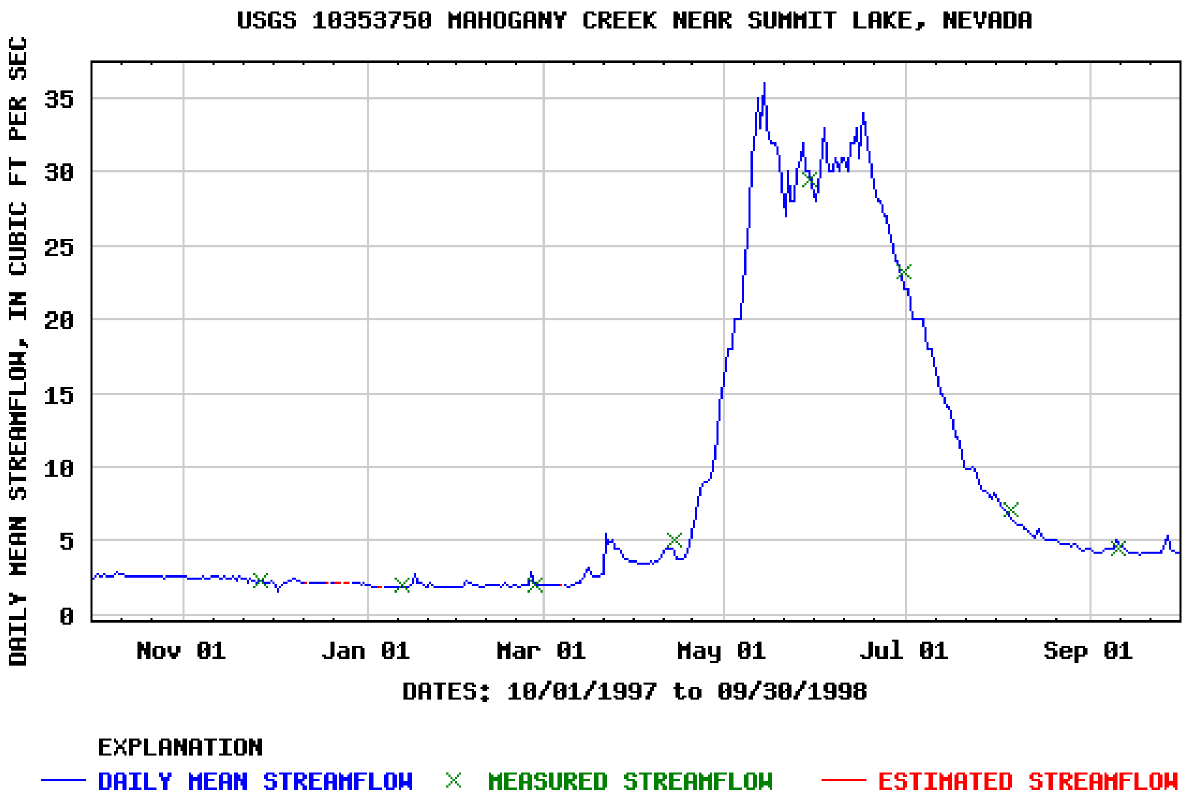
The geothermal leasing assessment area falls within the Great Basin physiographic province and can be accurately described as a high desert. Precipitation within the area is orographically controlled and elevation dependent. Much of the assessment area lies within the radius of influence of the rain shadow affect created by the Sierra Nevada Mountains. Average precipitation amounts across the area vary from 5-25 inches, with the majority of the precipitation being received as snow during the months of November through March.

Numerous small mountain streams flow within the area, many of which are perennial within their respective headwaters. The majority of stream flow is derived during the spring in direct response to the melting of the snow pack. Typical stream flow behavior, as shown in the annual hydrograph for Mahogany Creek (Northern Humboldt County), is depicted in Figure 3.3-1. Typical stream flow dynamics for the assessment area is for flow to originate at the upper elevations and enter the stream by way of overland flow and shallow groundwater discharge (interflow). As this flow exits the mountain block and onto the alluvial fan, the surface expression is quickly lost as it infiltrates into the valley fill aquifers through the coarse alluvial material at the upper end of the alluvial fan. Riparian vegetation exists in the mountainous areas prior to the water being lost as recharge. There are approximately 850 miles of perennial streams within the Winnemucca District.

There are three primary drainage features in the assessment area that are perennial on their respective valley floors. These are the Quinn, Kings, and Humboldt Rivers. The first two are small streams, which are perennial in their headwaters area and for a few miles on the valley floor.

The Quinn River originates in the mountains of southern Oregon and northern Nevada and flows southward. Mountain drainage converges in the vicinity of McDermit, Nevada. Flow appears to be perennial through the northern half of Quinn River Valley, although approximately 95 percent of the flow is lost over the upper 18 miles in Nevada. In the southern half of the Valley the river is ephemeral (Visher, 1957). The channel forms the boundary between the Kings River and Desert Valley hydrographic basins, crosses the southern end of Pine Forest Valley and eventually terminates on a playa in the Black Rock Desert hydrographic basin.

FIGURE 3.3-1
ANNUAL STREAM FLOW FOR MAHOGANY CREEK
(FISCAL YEAR 1998)



Source: http://waterdata.usgs.gov/nv/nwis/discharge

The principal source area of the Kings River is in the Bilk and Trout Creek Mountains at the north end of the valley. Additional contributing areas may exist in the mountains on the east and west sides of the south end of the valley; however, these areas likely produce surface water flow to the valley only during very wet years. All of the mountain drainages are appropriated for stock watering and irrigation. During low to normal flow, these diversions remove all the surface water at the mountain front. As a result, Kings River is generally dry over the majority of the valley. Malmberg and Worts (1966) estimate that the long-term average flow into southern Kings River Valley is no more than 1000 af/year.[10] This average relies on substantial

[10] Acre-foot per year. An acre-foot is the amount of water needed to cover one square acre, one foot deep.

flows during wet years because normal to dry years bring little or no flow to the southern end of the valley.

The Humboldt River flows through the southeast quarter of the Winnemucca District. The river enters the area west of Battle Mountain (Lander County) in the Clover Area hydrographic basin and flows northwestward toward the Golconda-Winnemucca area then southwestward through Rye Patch Reservoir to the Humboldt Sinks south of Lovelock at the south Pershing County line. Information provided on the U.S. Geological Service (USGS) Nevada website (http//waterdata.usgs.gov/nv/nwis/) identifies five gauging stations on the Humboldt River in Humboldt and Pershing counties. These stations are near Valmy and Comus in eastern Humboldt County, near Rose Creek in southern Humboldt County, and near Imlay and Lovelock in Pershing County. Currently operated gages are located at Comus and Imlay. Annual flow statistics available for these two gauges for the period 1990 thru 1999 indicate that on average the Humboldt River flows about 389 ft^3/s at Comus and 312 ft^3/s at Imlay.[11] These statistics are heavily influenced by irrigation diversions along the entire length of the river. South of Imlay, flow in the Humboldt River is impounded in a series of reservoirs (Rye Patch, Upper Pitt Taylor, and Lower Pitt Taylor). The Bureau of Reclamation developed these reservoirs for use in conjunction with the Pershing County Water Conservation District. In wet years, water that is not diverted for irrigation or held within the reservoirs, discharges to the Humboldt Sinks at the Pershing County line.

Springs

There are numerous springs within the assessment area. Perched or contact springs are the most common type of spring encountered. The source water for these springs is infiltrating precipitation that has been captured and concentrated in areas where fractured or unconsolidated material is underlain by less permeable material (aquitards) that inhibit the downward migration of water. These springs emanate at locations where the aquitard intersects the surface of the ground and the “perched” water seeps out. These springs are not directly connected with the surrounding water table and are generally unaffected by groundwater flow.

A less common, but ecologically and culturally significant spring that is encountered in the assessment area is the thermal spring. These springs are surface expressions of the geothermal resource and are discussed in further detail in section 3.12.1.3.

3.3.1.3 Groundwater Resources

Mountains in the area of study expose bedrock, which is usually igneous, intrusive or extrusive, but may locally be consolidated sediments. Materials eroded from the mountains fill the basins formed between with unconsolidated sediments, which range from coarse gravels to clays. The valley fill sediments may be associated with alluvial deposits or lake deposits. While alluvial fan deposits define the mountain/valley boundary at land surface the structural boundary is defined by the normal faults, which formed the mountains. All of these geologic elements are significant in the groundwater regime of the region.

[11] Cubic feet per second

Welch and Preissler (1990) describe a conceptual model of groundwater flow for the Black Rock Desert that is typical of basins in the assessment area. The greater portion of precipitation and recharge occurs in higher elevations owing to orographic effects. High evapotranspiration rates on the valley floor generally overwhelm precipitation and little recharge is thought to occur through the valley fill sediments. Precipitation in the mountains infiltrates the bedrock or flows from the mountain block and infiltrates as stream channels cross-mountain front faults or the apex of alluvial fans. Recharged waters flow through fractures and faults in the bedrock and from the bedrock to the valley fill. Ground water in the valley fill may rise to near ground surface and discharge as evapotranspiration or flow into an adjacent basin in the subsurface. Groundwater may also discharge as spring flow when geologic and hydraulic conditions force water upward to land surface.

The conceptual model recognizes three aquifers in the typical hydrographic basin: the valley fill aquifer, the alluvial aquifer, and the bedrock aquifer. Production of ground water by drilling wells is most commonly accomplished in the valley fill aquifer. Successful drilling in the bedrock aquifer is difficult and is usually only successful in areas of high fracture density.

Geothermal resources occur when infiltrating groundwater is directed into the vicinity of a heat source by flow along faults or deep in valley fill sediments. Conceptually, both geothermal and groundwater resources function similarly and frequently these resources may be interconnected not only in the recharge area but also in defining flow paths and discharge areas. For example, Campana (1980) suggests that the thermal waters which rise to create Leach Hot Springs in southeastern Grass Valley force non-thermal water to the south and east. Geothermal resources are discussed in more detail in section 3.12.1.3.

The Nevada State Engineer administers groundwater resources in Nevada by hydrographic basin. There are 40 hydrographic basins in the WFO area. The hydrographic basins of Nevada are grouped in hydrographic regions, eight of which are represented in the assessment area (see Table 3.3-1). The discussion of groundwater resources is organized by hydrographic regions. Because of the general character of the groundwater flow systems, conditions in individual hydrographic basins will be mentioned only to highlight unique features.

Northwest Region. The northwest corner of the assessment area is comprised of four hydrographic basins of the Northwest Region. The eastern side of this region exemplifies typical basin and range topography but to the west the basin and range topography is buried beneath volcanic flows (Sinclair, 1963). Surface water drainages connect the four basins during periods of excessive runoff. But the basins are considered independent from the standpoint of groundwater. The sand and gravel deposits of the valley fill sediments constitute the most productive aquifers in the region and yield moderate to large amounts of water. Flow may occur in the volcanic rocks but successful development would require intercepting productive fractures. Harrill and others (1988) indicate that the area receives underflow from the west and that discharge occurs by evapotranspiration. The principal areas of evapotranspiration are around Gridley Lake, Continental Lake, and along Thousand Creek in the eastern part of the region. Sinclair (1963) suggests that the perennial yield of the region is about 22,000 af/year. The Nevada Division of Water Planning (NDWP) (1992) indicates the perennial yield to be 12,000 af/year and that 29,142 af/year are committed. The greater portion of the commitment is in Gridley Lake Valley.

Black Rock Desert Region. This hydrographic region consists of 13 hydrographic basins and extends along a diagonal from the north central to the southwest portions of the assessment area. Quinn River, Silver State, Kings River, Desert, Pine Forest, and Black Rock Desert Basins are linked by the Quinn River surface drainage. Groundwater flow in these basins appears to be focused in the downstream direction (Harrill and others, 1988). Valley fill groundwater flow in other basins of the region is internal. All the basins, with the exception of the Smoke Creek Desert Basin, contribute underflow to the Black Rock Desert Basin. The Smoke Creek Desert Basin receives underflow from the west and from the San Emidio Desert basin to the east (Harrill and others, 1988). Discharge by evapotranspiration occurs in the central portion of each basin throughout the region, except in Desert Valley and High Rock Lake Valley Basins.

Visher (1957), Sinclair (1962a, 1962b), and Malmberg and Worts (1966) describe the groundwater conditions in the upper basins of the Quinn River drainage. Mountains adjacent to these basins are generally composed of rock through which groundwater does not flow freely. Groundwater recharge occurs principally by infiltration of streams, which originate in the surrounding mountains, as they flow across the valley fill sediments. Discharge occurs by evapotranspiration, domestic pumping, and by underflow in the valley fill sediments. Table 3.3-2 shows the estimated recharge, discharge, and perennial yield of these basins. The values of perennial yield are based on reconnaissance level studies and should be refined with detailed site-specific evaluations of yield if significant development is anticipated.

The Black Rock Desert Basin is the sink for much of the Black Rock Desert Hydrographic Region. It receives flow from the Quinn River during periods of high discharge (Sinclair, 1963a) and underflow from the upper Quinn River Basins (Harrill and others, 1988). Underflow is also received from basins along the west central, southwest, and southeast edges of the basin (Sinclair, 1963a; Harrill and others, 1988). Estimates of recharge, discharge, and perennial yield (Table 3.3-2) were made by analogy with other areas studied in the Great Basin because no access was available to low lying areas to measure plant cover (Sinclair 1963a).

Hualapai Flat Basin, in the southwest portion of the Black Rock Desert Hydrographic Region, is bordered principally by granitic and volcanic rocks. Precipitation in the mountains flows to the sediment filled valley and infiltrates as it crosses the alluvial sediments (Sinclair, 1962c). Harrill and others (1988) identify an area of evapotranspiration at the southeast edge of the flat and underflow from Hualapai Flat into the Black Rock Desert Basin.

The extreme southwest end of the Black Rock Desert Hydrographic Basin consists of Smoke Creek Desert and San Emidio Desert Basins. Mountains surrounding these basins are composed primarily of igneous rocks, consolidated sedimentary and metamorphosed rocks are present to a lesser extent (Glancy and Rush, 1968). The consolidated rocks receive and transmit water as evidenced by the presence of small springs. No estimate of the amount of water in these rocks or their ability to transmit the water is available. The principal aquifer in both basins is the alluvial sediments filling the valley. Harrill and others (1988) identify areas of evapotranspiration throughout the Smoke Creek Valley and at the northern end of the San Emidio Desert Basin.

They also indicate underflow from the San Emidio Desert to both the Smoke Creek Desert and the Black Rock Desert. The Smoke Creek Desert Basin has been considered a potential water source for urban development in Washoe County (Maurer, 1993).

Perennial yield in that portion of the region in the assessment area is estimated to be 177,300 af/year. Approximately 324,735 af/year have been committed for various uses (see Table 3.3-1). The greatest portion of water resources development occurs in those hydrographic basins, which lie along the Quinn River in the northern part of the region.

Humboldt River Region. That portion of the Humboldt River Region in the assessment area, extends from the eastern edge of Humboldt County in a southwesterly direction across central Pershing County and ends in northwest Churchill County. The Clovers Area, Kelly Creek Area, and Pumpernickel Valley Hydrographic Basins group around the river at the east Humboldt County line. North of the river in the upper portion of the hydrographic region are the Hardscrabble Area, Little Humboldt River, and Paradise Valley Hydrographic Basins which are tributary to the Little Humboldt River. Grass Valley Hydrographic Basin is tributary to the Humboldt River near Winnemucca. Below Winnemucca, the Humboldt River flows through the Winnemucca Segment, Imlay Area, Lovelock Valley, and White Plain hydrographic basins.

In broad terms, two lithologic units underlie the drainage area of the Little Humboldt River (Harrill and Moore, 1970). Unconsolidated sediments fill the valleys, are highly porous, and commonly transmit water readily. Consolidated rocks, which occur in the mountains and underlie valley fill, include volcanic rocks in the north and northeast, consolidated sedimentary rocks in the southeast, and granitic and metamorphic rocks in the Santa Rosa Range on the west side of Paradise Valley. These rocks have low porosity and permeability and do not readily transmit water.

Infiltration of mountain runoff is the principal source of recharge to the valley fill aquifers. A small quantity of mountain precipitation may infiltrate fractured consolidated rock (Harrill and Moore, 1970). Natural discharge by evapotranspiration occurs along the channel of the Little Humboldt River and on the floor of Paradise Valley (Harrill and others, 1988). Harrill and others (1988) suggest that groundwater moves from Hardscrabble Area and Little Humboldt River Basins to Paradise Valley and from Paradise Valley into the Humboldt Valley underflow. Recharge to these hydrographic basins is estimated to be in the range of 46,000 af/year (Harrill and Moore, 1970) and 54,000 af/year (Harrill and others, 1988). Evapotranspiration loss from these basins under natural conditions is estimated at about 50,000 af/year during dry years. Underflow from Paradise Valley into the Humboldt River Valley range from about 3,000 to 4,400 af/year (Harrill and Moore, 1970; Harrill and others, 1988).

Mountains bounding the Clovers Area, Kelly Creek Area, and Pumpernickel Valley Hydrographic Basins expose a variety of highly faulted igneous, metamorphic, and consolidated sedimentary rocks (Willden, 1963). Hydrologically these mountains likely behave similarly to those of the Little Humboldt River and adjacent basins where most precipitation runs off and recharges the valley fill aquifer at the alluvial fan margin while a small volume of water infiltrates through fractures in the bedrock. Harrill and others (1988) identify a broad area of evapotranspiration on the floor of these basins. They estimate that recharge to the valley fill aquifer is about 16,000 af/year and that underflow into and out of the basins follows the river channel.

Groundwater recharge in Grass Valley occurs as a result of snowmelt runoff infiltration on the alluvial fans at the mountain front. Cohen (1964) estimates natural recharge to be about 12,000 to 13,000 af/year. Natural discharge occurs as evapotranspiration, about 7,000 af/year, and underflow into the Humboldt River valley, 6,000 af/year.

In the three hydrographic basins along the central and lower reaches of the Humboldt River in the assessment area, recharge to the valley fill aquifer originates as precipitation within the area, seepage losses from the Humboldt River, and underflow through valley fill from the upstream section (Eakin, 1962; Harrill and others, 1988). Water moves down the river valley as underflow through the valley fill sediments in addition to the stream flow in the Humboldt River. Under normal flow conditions the river flows to the Humboldt Sinks south of Lovelock. Minor amounts of underflow may continue down valley from the Sinks and discharge to the Carson Sink Basin to the southeast. Additional groundwater discharge occurs by evapotranspiration from the narrow flood plain along the river channel. Recharge to these three basins is estimated to be about 14,400 af/year (Harrill and others, 1988). Surface flow and underflow from the basins is negligible, suggesting that this amount, plus flow in the river, is consumed as evapotranspiration by native vegetation and crops.

Within the Humboldt River Region, groundwater development appears to be the greatest in the northern hydrographic basins. Paradise Valley has the largest volume of committed water resources of any basin in the region. For the region as a whole, the perennial yield is estimated to be 184,100 af/year and committed resources are about 308,045 af/year (see Table 3.3-1).

West Central Region. The West Central Hydrographic Region includes four hydrographic basins and lies in the southwest corner of Pershing County, the southwest corner of the assessment area. It is bound on the east by the lower end of the Humboldt River Region and on the west by Winnemucca Lake Basin of the Truckee River Hydrographic Region. Mountains bounding basins of the region expose volcanic, consolidated sedimentary, granitic, and metamorphic rocks. These rock units generally transmit water only along fractures (Harrill, 1970). Alluvial sediments in the valleys constitute the major groundwater aquifers of the region. Groundwater systems in the region are recharged by infiltration of precipitation through fractures in the bedrock of the mountains and infiltration of stream flow at the edges of the valley fill. Most groundwater in Kumiva Valley moves as underflow into Granite Springs Valley. Groundwater in Granite Springs Valley moves from the mountains to the phreatophyte discharge area near the valley center. Groundwater in Fireball Valley likely enters Brady Hot Springs Area as under flow and discharges from the phreatophyte area north of Brady Hot Springs and the area surrounding the Fernley Sink. Brady Hot Springs Area may also receive underflow from the Fernley Area to the south. Groundwater recharge in the region is estimated to be about 4,900 af/year (Harrill, 1970). Evapotranspiration in the region is estimated at about 7,700 af/year. Harrill (1970) recognizes a significant imbalance between the inflow and outflow in the region. Several alternatives are described that might account for the imbalance but he does not resolve the difference. The perennial yield is 7,600 af/year; 2,704 af/year are committed to permintted uses (see Table 3.3-1). The greatest portion of these commitments are in Brady Hot Spring area.

Truckee River Region. Winnemucca Lake Valley is the only hydrographic basin in the Truckee River Hydrographic Region that is in the WFO assessment area. The valley is bordered on the east and west by mountains composed of igneous, metamorphic, and consolidated sedimentary rocks. Through untested, these consolidated rocks are considered to be the poorest water-yielding unit in the area (Van Denburgh and others, 1973). They yield minor amounts of water to springs and may yield minor amounts to wells, where fractures are intercepted. Generally, these rocks refuse precipitation infiltration (except in areas of fracturing). Precipitation runs off to the valleys and infiltrates as flow crosses the alluvial sediments. Recharge in this manner is estimated to be about 2,900 af/year (Van Denburgh and others, 1973; Harrill and others, 1988). The basin may also receive minor amounts of recharge by underflow across its southern end (Harrill and others, 1988). All recharge to the valley is thought to be discharged by evapotranspiration along the central axis of the valley fill sediments (Harrill and others, 1988). In addition, the valley fill aquifer water level may still be declining as a result of the drying up of Winnemucca Lake in 1940 (Van Denburgh and others, 1973). Lower water levels reflect the loss of water from storage in the valley fill aquifer. The long-term perennial yield of the basin is about equal to the natural recharge 2,900 af/year (Van Denburgh and others, 1973). Nevada Division of Water Planning (NDWP, 1992) estimates perennial yield to be 3,300 af/year and the committed resources to be 262 af/year (see Table 3.3-1).

Carson River Region. Packard Valley, a sub-basin in the Carson Desert Hydrographic Basin, is the only element of the Carson Desert Hydrographic Region within the WFO assessment area. Mountains composed of igneous, metamorphic, and consolidated sedimentary rocks define the sub-basin (Glancy and Katzer, 1975). The lack of springs along the mountain front in Packard Valley suggests that this area is relatively unfractured and that precipitation falling on the mountains runs off the adjacent valley. Glancy and Katzer (1975) estimated that recharge from infiltration of mountain runoff in Packard Valley is only about 77 af/year. Approximately 340 af/year of groundwater is discharged by transpiration within Packard Valley. Groundwater flow in the valley fill aquifer is southward toward the main area of the Carson Desert Basin where the water is likely lost by evapotranspiration. NDWP (1992) estimates perennial yield at 710 af/year and committed resource at 2,621 af/year (see Table 3.3-1).

Central Region. This hydrographic region consists of five hydrographic basins within the assessment area. Buena Vista Valley and Buffalo Valley are internally draining basins with no apparent underflow to adjacent basins (Harrill and others, 1988). They receive recharge of 10,000 and 12,000 af/year, respectively, from precipitation within each basin. Under natural conditions, all of the recharge is discharged by evapotranspiration from the valley in the central part of each basin.

Only the extreme northern end of Dixie Valley is included in the WFO assessment area. This portion of the valley contains evidence of significant geothermal resources. In addition, northern Dixie Valley appears to be hydrologically linked to Pleasant and Jersey Valleys to the north.

The consolidated rocks in the mountains surrounding the Dixie, Pleasant, and Jersey Valley areas are composed of igneous, metamorphic, and consolidated sedimentary rocks. These rocks have little or no internal porosity; thus, transmission of groundwater over large areas is unlikely (Cohen and Everett, 1963). Water may move through fractures in the consolidated rocks, however, resulting in transmission of water to springs or to the valley fill aquifer. Precipitation on the mountains may infiltrate through fractures or flow through ephemeral channels to the valley where runoff infiltrates the alluvial sediments recharging the valley fill aquifer. Natural discharge from the valleys is by evapotranspiration.

Cohen and Everett (1963) and Harrill and others (1988) suggest that recharge to Pleasant and Jersey Valleys is approximately 4,000 af/year. Flow in the valley fill aquifer directs some of this water to an area of evapotranspiration along the centerline of the valley. Pleasant and Jersey Valleys transmit about 1,000 af/year each into northern Dixie Valley by underflow. In addition, Dixie Valley is thought to receive approximately 6,000 af/year recharge by infiltration of precipitation and minor amounts of underflow from adjacent valleys at its southern end (Cohen and Everett, 1963; Harrill and others, 1988). Perhaps about 10 to 16 percent of the precipitation recharge to Dixie Valley occurs in the area within the WFO assessment area. Virtually all of the precipitation recharge to these valleys is believed to be discharged by evapotranspiration. Perennial yield is limited to the amount of natural discharge that can be intercepted (Cohen and Everett, 1963), a maximum of about 4,000 af/year in northern Dixie, and Pleasant, and Jersey Valleys.

For the five Central Region basins wholly or partly in the assessment area, 35,850 af/year is the perennial yield; 81,507 af/year is estimated to be the amount of committed water resources (see Table 3.3-1). The greatest portions of the commitments occur in Dixie Valley and Buena Vista Valley.

3.3.1.4 Water Quality

The chemical character and quality of a natural water source is determined by mineral content of the rock that water flows across or through and the ease with which the rock minerals dissolve into the water. Processes and conditions, which influence the concentration of dissolved constituents, include contact time between water and rock minerals, evaporation and evapotranspiration, and temperature.

Precipitation, because it has not yet come in contact with geologic materials, typically has very low concentrations of dissolved minerals and is considered very good quality. The contact time between precipitation runoff and rock minerals is short for water in streams and lakes at higher elevations where precipitation is most common. Generally, these waters also have low concentrations of dissolved minerals and are considered good quality. Groundwater moves relatively slowly through rocks that comprise an aquifer and therefore, has greater potential to dissolve minerals. Greater distance from the recharge area implies greater contact time between groundwater and the aquifer rocks. As a result, groundwater chemistry at discharge areas generally exhibits somewhat higher concentrations of dissolved minerals and is of somewhat lesser quality than water in the recharge area. However, these variations may be masked by other influences in complicated flow systems.

Evaporation and evapotranspiration can have a significant impact on water quality. Because these processes remove water molecules from the source but leave dissolved minerals, the concentration of dissolved minerals increases in the water which remains. In some circumstances, lakes or ponds that do not have a consistent supply of fresh water and are subject to evaporation would exhibit a decrease in water quality owing to the increase in dissolved minerals. Groundwater that rises to near ground surface, and is subject to evaporation and evapotranspiration, would have increased concentrations of dissolved minerals. For these reasons, groundwater resources near the center of hydrographic basins often may be somewhat saline.

Temperature also has potential to impact water chemistry and quality. Most rock minerals dissolve more easily under higher temperatures. Thus, groundwater that have been heated in geothermal systems typically contains higher levels of dissolved minerals than do low temperature groundwater resources. Additionally, thermal water may dissolve minerals that have potential to affect the pH (acidity) of the water.

In typical hydrographic basins, water quality would be best in the mountains where precipitation is most common. Surface water flowing from the mountains and groundwater near the mountain front would generally be of good quality. However, near the basin center or in discharge areas water quality would be less due to evapotranspiration. Thermal waters would have still lower quality resulting from the influence of temperature on mineral dissolution. Mixing of low quality thermal water with better quality waters would result in water of intermediate quality. The result of mixing would depend on the relative amounts of water from the various sources.

Northwest Region. Sinclair (1963) recognizes that four samples are inadequate to assess water quality in the Pueblo Valley-Continental Lake area. However, he notes that groundwater probably is satisfactory for irrigation and domestic use although areas of the central parts of the valley may be underlain by saline water.

Black Rock Desert Region. Generally, the water quality in all basins of the Black Rock Desert Hydrographic Region is suitable for irrigation, domestic, and stock uses (Visher, 1957; Sinclair, 1962a; Sinclair, 1962b; Sinclair, 1962c; Sinclair, 1963a; Malmberg and Worts, 1966; Glancy and Rush, 1968). In those basins where groundwater flows toward a central basin playa or lakebed, the water quality deteriorates from the valley margin toward the valley center. Thermal springs, where they are present, are described as unsuitable for irrigation use due to a high concentration of trace elements. Salinity may also be a concern in terms of irrigation applications.

Humboldt River Basin. Chemical quality of groundwater and surface water is generally suitable for irrigation and domestic use. A few wells in the south end of Paradise Valley produced waters with high salinity and sodium, which exceed drinking water standards and make them hazardous for irrigation use (Harrill and Moore, 1970).

Groundwater samples collected in Grass Valley indicated suitable quality for irrigation and domestic use. About 10 percent of the samples showed somewhat elevated salinity or trace elements, which would require special handling or would prevent use of the water for irrigation and domestic use (Cohen, 1964).

Chemical quality of the valley groundwater depends on location. Generally water obtained from the middle parts of the alluvial aprons near the areas of principal recharge is of better quality than groundwater obtained from the center of the valley (Eakin, 1962). Additionally, groundwater south of Lovelock is of poor quality and unsuitable for agricultural or domestic use (Everett and Rush, 1965).

West Central Region. Water quality in Kumiva and Granite Springs Valleys is suitable for irrigation or domestic use though the quality may deteriorate near the playa. In Brady Hot Springs area no samples were observed to have suitable quality for domestic use and high salinity levels would limit application for irrigation (Harrill, 1970).

Truckee Basin. Van Denburgh and others (1973) describe the quality of groundwater in Winnemucca Lake Basin to be of generally poor quality in the central and eastern parts of the area and therefore unsuitable for domestic use. Suitability for agricultural use must be determined locally.

Carson Desert Region. Water quality information is reported for only one well in the Packard Valley (Glancy and Katzer, 1975). This sample would be considered unsuitable for domestic use due to high total dissolved solids content, and marginal for irrigation use due to medium salinity levels.

Central Region. Buena Vista Valley is reported by Garcia and Jaconobi (1991) to have eight water analyses from wells in the valley. All but two of these well samples appear to have total dissolved solids concentrations in excess of drinking water standards. Buffalo Valley has no water analyses reported by Garcia and Jaconobi (1991).

3.3.2 Environmental Impacts

General Impacts. Potential impacts to water resources resulting from geothermal development derive from (1) the extraction of thermal fluids and groundwater from underground reservoirs, and (2) disposal of spent thermal fluids. Activities of the exploration phase would likely have minimum impact because the volumes of fluid concerned are minimal. Development phase activities would have a somewhat greater potential impact, primarily related to disposal of thermal fluids produced during reservoir testing. Impacts from these two phases would be of short duration and limited to a small area. Production would have the greatest potential for impacting water resources as a result of both changes to reservoir hydraulics and spent fluid disposal.

Geothermal and groundwater reservoirs are closely connected. Infiltration of precipitation on surrounding mountains is the source of recharge to both reservoirs. There are no impermeable boundaries, which separate hydraulic conditions of thermal and non-thermal flow systems. The thermal and non-thermal flow systems exist in the same area in equilibrium with each other. As a result of interconnections, changes in one reservoir would likely have an impact on the adjacent reservoir. Thus, extraction of geothermal fluid, which would cause a change in hydraulic head in the thermal reservoir, could also produce a change in hydraulic head and flow pattern in an adjacent groundwater reservoir. Loss of hydraulic head in either the geothermal reservoir or groundwater reservoir could result in decreased spring flow and decreased water levels in wells in the area. Users of impacted wells would likely see an increase in energy costs for pumping and in extreme cases shallow wells might dry up entirely. Timing and magnitude of these impacts depend upon the hydraulic connection between the point of geothermal extraction and springs and wells.

Re-injecting spent geothermal fluid into the source reservoir could minimize the loss of hydraulic head due to extraction. However, spent fluid is seldom re-injected at precisely the point of withdrawal because the cooler spent fluid would moderate the quality of the thermal resource. Therefore, a zone would exist around production wells in which hydraulic head is impacted by the withdrawal. The extent of that zone of influence would depend on specific reservoir characteristics, and any springs and wells within the zone of influence would be impacted. The magnitude of the impact could be a function of proximity of the spring or well to the production well.

Geothermal development could require process water derived from sources other than the geothermal reservoir. In such instances, groundwater is the most likely resource. Extraction of groundwater could result in an impact to the hydraulic character of the groundwater resource. These impacts could include: changes to the hydraulic head in the reservoir which could, in turn, result in reduced spring discharge and lower water levels in wells; or consumptive use of the groundwater, thereby limiting the resource available to other potential users.

Geothermal fluids produced during reservoir testing and development, and spent fluids not consumed in the industrial process, must be disposed after use. These fluids could be disposed by re-injection to the reservoir from which they were withdrawn, or by discharge to surface water or groundwater systems. Because geothermal fluids tend to be of lesser quality than groundwater or surface water resources, disposal could have an environmental impact. Re-injection of spent fluids to the source reservoir is generally considered to be environmentally benign with regard to water quality impacts. Discharge of thermal fluids produced during reservoir testing, or spent thermal fluids to surface water or groundwater resources would likely result in deterioration of the quality of these resources. Discharge of thermal fluids to surface water channels would potentially result in erosion of the channels and deposition of sediments downstream where flows terminate.

3.3.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," environmental impacts cannot be determined for individual leases or for exploration, development, or production activities. Existing data describing surface water systems, groundwater reservoirs, geothermal reservoirs, the interrelationships of these systems, or specific exploration, development, and production activities are inadequate to determine specific effects of these activities on the region, PVAs, KGRAs, or pending leases. This updated PEA would permit inclusion of updated stipulations, mitigation measures, and/or performance standards specific to each lease, and could help ensure the long-term health of the area's hydrologic system and water quality.

The following are the potential environmental impacts on hydrology and water quality when analyzing the "reasonably foreseeable development scenario."

Exploration. Industrial applications of geothermal resource would involve exploration, development, and production activity. In addition to data collection at land surface, exploration could include drilling holes for collection of subsurface information such as temperature gradient data and cores for lithology and permeability analysis, or for setting explosive charges for seismic analysis. It is assumed that this phase of activity would not produce significant quantities of groundwater or geothermal fluids. However, small volumes of fluid would be produced as a result of drilling into the saturated zone. Fluids produced during drilling are generally incorporated into the drilling fluid. On completion of drilling, remaining drilling fluids are contained in a sump or mud pit and must be disposed.

Development. Development, or testing, of the geothermal resource is focused on evaluation of the hydraulic and production character of the geothermal reservoir. Wells would be drilled into the geothermal reservoir and production of geothermal fluids would be necessary to evaluate the reservoir. The volume of fluid produced would depend on the duration of tests performed, which could last from 10s of hours to 10s of days. Fluid volumes produced during this phase of activity could be small relative to production but they would likely be significant and must be disposed during or following testing. Disposal could be an issue depending upon the chemical quality of the geothermal fluids.

Production. The final phase of activity would involve the production and disposal of large volumes of geothermal and spent fluids. Disposal options could include re-injection to the source reservoir or release to the land surface. Production could also involve the extraction of groundwater resources for cooling or other process related needs. Impact issues associated with the production phase of geothermal development are related to hydraulic and hydrologic changes in the geothermal and adjacent groundwater reservoirs and to disposal of spent fluids, which are likely to be of poor quality.

Specific impacts to water resources resulting from geothermal development would depend on the specific character and location of the development. Production features (number and location of wells, pumping rates, and disposal methodology), thermal reservoir character (thermal quality, chemical quality, hydraulics and hydrology), and groundwater reservoir factors (chemical quality, recharge, hydraulics and hydrology, spring discharge, other users) would all be critical in evaluating the impacts of geothermal development. Because these factors are either not known or are known only in a general way, it is not possible to assess the specific impact of individual geothermal developments.

Close-Out. During the close-out phase, production and injection wells would be capped and the geothermal resources would no longer be extracted from, or re-injected into, the geothermal reservoirs.

3.3.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.4 VEGETATION

3.4.1 Affected Environment

The assessment area supports vegetation typical of the Great Basin region. The extremes of climate, elevation, exposure and soil type all combine to produce a diverse growth environment for a wide variety of plants. The main zonal plant communities in northern Nevada are playa lakebed (unvegetated), desert sink scrub, saltbush scrub, sagebrush scrub, pinyon-juniper woodland, subalpine woodland, and montane coniferous forest. Azonal communities include broadleaf riparian scrub, woodland and forest, dune, and meadow. Plant communities have been subdivided into associations or alliances. A system is being developed at this level throughout the United States. Eventually the extent of each association can be analyzed for rarity. The Nevada Natural Heritage Program maintains a complete list of alliances and associations for the State of Nevada. Also, the willow riparian woodland has been lumped. The following communities and associations have been mapped within the assessment area.

TABLE 3.4-1
PLANT COMMUNITY ACREAGE FOUND WITHIN THE ASSESSMENT AREA

Plant Community/ Association		Acreage	% of Total Vegetation	Acreage for the Resource District*
A	**Desert sink scrub**	**278,438**	**8.27**	
1	Iodine bush	6,768	0.02	16,242
2	Alkali sacaton	1,157	0.03	11,033
3	Black greasewood	225,701	6.86	512,317
4	Greasewood-sagebrush	44,812	1.36	66,345
A/B	Desert sink-saltbush transition			
1	Shadscale-black greasewood	153,076	4.65	687,424
B	**Saltbush scrub**	**1,473,159**	**44.79**	
1	Shadscale	378	0.01	12,363
2	Shadscale-Bailey greasewood	353,132	10.76	671,735
3	Shadscale-Cooper wolfberry	3,549	0.1	4,746
	Shadscale-black greasewood	153,076	10.7	687,424
4	Shadscale-budscale	957,063	29.1	2,120,558
5	Sickle saltbush	653	0.01	3,734
6	Four-wing saltbush	100,030	3.04	165,159
7	Horsebrush-4-wing saltbush	5,944	0.18	5,944
8	Torrey"s quailbush	32,651	0.99	60,167

Plant Community/ Association		Acreage	% of Total Vegetation	Acreage for the Resource District*
9	Spiny hop sage	5,787	0.17	7,598
10	Winterfat	13,972	0.42	39,304
C	**Sagebrush scrub**	**966,051**	**29.35**	
1	Threetip sagebrush	387	0.01	2,622
2	Black sagebrush	41,102	1.25	158,222
3	Wyoming sagebrush	583,814	17.75	2,652,693
4	Mountain sagebrush	51,692	1.57	789,498
5	Big sagebrush	86,424	2.62	285,483
	Basin sagebrush	79,054	2.4	143,107
6	Lahontan sagebrush	181,299	5.51	844,942
7	Low gray sagebrush	21,333	0.64	587,223
D	**Freshwater marsh**			
1	Emergent aquatic-cattails	766	0.02	498
E	**Riparian scrub-forest**	**53,572**	**1.62**	
1	Willow	50,379	1.53	88,882
2	Silver buffaloberry	3,193	0.09	4,038
F	**Meadow bottomland**			
1	Tufted hairgrass	50	Trace	1,074
G	**Alkali meadow**			
1	Inland saltgrass	8,206	0.25	8,206
H	**Pinyon-juniper woodland**	**76,358**	**0.69**	
1	Pinyon-Utah juniper	11,874	0.36	43,062
2	Utah juniper	10,912	0.33	117,400

*Total vegetation cover for the Winnemucca resource district.

TABLE 3.4-2
OTHER LAND FORMS

Other Land Forms	Acreage	Percent	Acreage for the Resource District*
Playa lakebed	148,888	4.52%	659,437
Open water	13,346	0.4%	22,673

*Total vegetation cover for the Winnemucca resource district.

The assessment area has been divided into numbered hydrographic regions. Hydrographic Region 1 is located in the northwestern portion of the resource area. It contains one PVA,and 15 sections of pending leases. The PVA is adjacent to the Sheldon National Wildlife Area. The main drainage is the Craine Creek drainage. The dominant vegetation is sagebrush and shadscale-budsage.

Hydrographic Region 2 is a large region making up the western boundary of the WFO. The region is made up of low valleys and the Granite Range (9,056 feet elevation). The main lease applications are north of Gerlach and in the San Emido Desert. This hydrographic region contains two KGRAs, five PVAs, and three pending lease areas. The dominant vegetation is Wyoming sagebrush, shadscale-budscale, black greasewood, and shadscale with greasewood.

Hydrographic Region 3 is a small region in the northeastern corner of the resource area. It is east of the Humboldt Toiyabe National Forest and drains the eastern slopes of the Santa Rosa Range. This drainage system is dominated by Wyoming sagebrush and low gray sagebrush. This region does not contain leases.

Hydrographic Region 4 is a large drainage making up the east-central portion of the resource area. It contains three PVAs and scattered lease sections near Edna Mountain, the California Emigrant Trail, and near Little Poverty Mountain. The region is drained by the Humboldt River. The dominant vegetation is Wyoming sagebrush, mountain sagebrush, low gray sagebrush, willow riparian forest, and greasewood scrub. Geothermal exploration would take place in saltbush and sagebrush scrub.

Hydrographic Region 5 is a moderate sized drainage in the southwestern portion of the resource area surrounded by mountains. The southern portion contains pending leases within a KRVA and lease applications near Cinnabar Peak. The dominant vegetation is shadscale-greasewood, shadscale-budsage, Wyoming sagebrush, and low gray sagebrush. The KRGA is located within saltbush scrub.

Hydrographic Region 6 is dominated by Pyramid Lake and land ownership is primarily Native American. The eastern portion is in the southwestern corner of the assessment area. Several lease sites are located east of Russell Peak. Much of Hydrographic Regions 5 and 6 are in a large PVA. The dominant vegetation is shadscale-budsage, and Lahontan sagebrush. The pending leases are located within saltbush scrub.

Hydrographic Region 10 is a large basin containing the Dixie Valley Drainage. It contains three PVAs, two KRVAs, and several scattered pending lease sites. The dominant vegetation is shadscale-greasewood association. The geothermal exploration would take place in saltbush scrub.

TABLE 3.4-3
PLANT ASSOCIATION ACREAGE BY HYDROGRAPHIC REGION

Plant Community/ Association	HR-1	HR-2	HR-3	HR-4	HR-5	HR-6	HR-10
Desert sink scrub							
Iodine bush	29	1,832		7,091	1,736		
Alkali sacaton	204			10,828			
Black greasewood	10,434	290,142		167,753	4,310	11,193	10,998
Greasewood-sagebrush	7,111	33,822		24,539			
Desert sink-saltbush transition							
Shadscale-black greasewood	2,612	210,579		115,476	4,008		
Saltbush scrub							
Shadscale		12,127		235			
Shadscale-Bailey greasewood	155			108,867	250,470	32,516	
Shadscale-boxthorn				3,737			
Shadscale-black greasewood	7,804	478,565				3,001	
Shadscale-budscale	52,890	554,796		707,891	230,102	61,373	
Sickle saltbush		1,522	197	797	1,217		
Four-wing saltbush		67,983		25,507	44,769	15,454	
Horsebrush-4-wing saltbush						5,945	
New Mexico (Torrey) saltbush	3,382	15,397		4,035			
Spiny hop sage		6,827		770			
Winterfat		15,385	90	19,186	4,643		
Sagebrush scrub							
Threetip sagebrush	2,531						
Black sagebrush	2,320			86,546			

Plant Community/ Association	HR-1	HR-2	HR-3	HR-4	HR-5	HR-6	HR-10
Wyoming sagebrush	11,281	939,441	152,929	1,010,246	223,269	25,971	
Mountain sagebrush	82,889	397,544	1,340	199,964	25,912	5,430	
Big sagebrush	24,656	194,318	490	82,868		11,938	743
Basin sagebrush	7,408	478,117	327	84,827			
Lahontan sagebrush	38,379	550,731		71,962	147,127	36,643	
Low gray sagebrush	21,308	320,437	55,717	176,710	1,381		
Fresh water marsh							
Emergent aquatic-cattails					498		
Riparian scrub-forest							
Willow		20,995	143	66,724			
Silver buffaloberry		3,950					
Meadow bottomland							
Tufted hairgrass	222	852					
Alkali meadow							
Inland saltgrass		8206					
Pinyon-juniper woodland							
Pinyon-Utah juniper							
Utah juniper		109,119		8,286			

See Figure 2-1 for hydrographic unit number location

3.4.1.1 Zonal Plant Communities

Barren Playas. Only 4.5 percent of the PVAs are composed of lakebeds. Playas are generally devoid of vegetation due to high concentrations of salts associated with standing water that slowly evaporates after rains. Sandy islands with vegetation occasionally form on the lakebeds.

Desert Sink Scrub. Approximately 8 percent of the PVAs are composed of desert sink scrub plant community. It occurs in valley bottoms throughout the assessment area. Black greasewood is an indicator of a high water table and is closely associated with alkali meadows and dry bottomland. This vegetation type mainly produces less palatable shrubs and few grasses. Annual precipitation is 3-8 inches. Plants growing here are: big sagebrush, shadscale (*Atriplex confertiflora*), gray molly kochia, alkali rabbitbrush (*Chrysothamnus parryi*), seepweed, alkali sacaton (*Sporobolus airoides*), inland saltgrass (*Distchlis* spicata), Indian ricegrass (*Oryzopsis hymenoides*), bottlebrush squirreltail (*Elymus elymoides*), and bluegrass. This plant community has been mapped with three associations:

Allertolfea occidentalis (iodine bush) association
Sarcobatus vermiculatus (black greasewood) association
Sarcobatus vermiculatus -Artemisia tridentata (greasewood-sagebrush) association

Saltbush Scrub. This is the most dominant vegetation type in the assessment area. It covers approximately 44 percent of the PVAs. The ecological sites associated with this type occur mainly in the valleys on alluvial fans and up into the hills in the southern portion of the assessment area. Precipitation ranges from 3-8 inches. In these areas, the vegetation is dominated by shadscale and bud sagebrush (*Artemisia spinescens*), Bailey greasewood (*Sarcobatus baileyi*), Douglas rabbitbrush (*Chrysothamnus douglasii*), four-wing saltbush (*Atriplex canescens*), or winterfat (*Krashenninikovia lanata*). Perennial grasses include Indian ricegrass, bottlebrush squirreltail, needle and thread (Stipa sp.), sand dropseed (*Sporobolus cryptandrus*), and desert needlegrass (*Stipa speciosa*). The saltbush community has been divided into ten associations, they are:

Atriplex gardneri var. *falcata* (sickle saltbush) association
Atriplex canescens (four-wing saltbush) association
Tetradymia sp.-Atriplex canescens (Horsebrush-4-wing saltbush) association
Atriplex confertifolia-Artemisia spinosa (shadscale-budsage) association
Atriplex confertifolia-Sarcobatus vermiculatus (shadscale-greasewood) association
Atriplex confertifolia-Lycium cooperi (shadscale-wolfberry) association
Atriplex confertifolia-association
Atriplex torreyi (Torrey's quailbush) association
Grayia spinescens (spiny hopsage) association
Krashenninikovia lanata (winterfat) association

Sagebrush Scrub Plant Community. The sagebrush community makes up 29 percent of the vegetation within the PVAs. Sagebrush scrub is the second most common vegetation type in the PVAs. Sagebrush is not as tolerant of saline soils as saltbush. Big sagebrush occurs mainly in the mountains and hills and is less common in the southern half of the planning area, which is dryer and warmer. This community is dominated by four subspecies of Great Basin sagebrush (*Artemisia tridentata* ssp. *tridentata*, ssp. *Wyomingensis*, ssp. *vaseyana* and ssp. *lahontensis*. The height of this scrub is between 1 and 6.5 feet tall and total cover can range from 10 percent on degraded sites to nearly 60 percent. More commonly, shrub cover is about 25 percent of the ground while forbs and grasses cover another 25 percent. Another common sagebrush in the assessment area is the much lower black sagebrush (*Artemisia nova*), which is normally common on, carbonate hillsides.

While sagebrush often form pure stands, more commonly it is associated with many other shrub species primarily desert peach (*Prunus andersoni*), and green Ephedra (*Ephedra viridis*). Rubber and sticky leaf rabbitbrush (*Chrysothamnus nauseosus and C. viscidiflorus*) are common early successional species following fires. Spiny hopsage (*Grayia spinosa*) frequently occurs at the lower elevations and is part of the transition at lower elevations with the saltbush scrub community. Common grasses in the sagebrush scrub include squirreltail grass (*Elymus elymoides*), great basin wildrye (*Elymus cinereus*), Sandburg bluegrass (*Poa secunda*), muttongrass and beardless wheatgrass, bluebunch wheatgrass (*Pseodoroegeria spicata*), Thurber needlegrass (*Achnatherum thurberianum*), and needle and thread grass (*Stipa comata*). Cheat grass (*Bromus tectorum*) is a major problem in this community after fires. Eight associations of sagebrush scrub have been mapped, they are:

Artemisia arbuscula (low gray sagebrush) association
Artemisia tridentata ssp. *tridentata* (Big sagebrush)
Artemisia tridentata ssp. *vaseyana* (Basin big sagebrush)
Artemisia tridentata ssp. *wyomingensis* (Wyoming sagebrush) association
Artemisia tridentata ssp. *vaseyana* (Mountain sagebrush) association
Artemisia tridentata ssp. *lahontensis* (Lahontan sagebrush) association
Artemisia tripartita (threetip sagebrush) association
Artemisia nova (black sagebrush) association

Pinyon-Juniper Woodland. Single-leaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) woodlands visually dominate less than one percent of the PVAs. These woodlands grow in the mountains and are more common at higher elevations. Understory vegetation is sparse and usually includes black sagebrush or big sagebrush. Understory plants also include bitterbrush (*Purshia glandulosa*), green Ephedra (*Ephedra viridis*), desert snowberry (Symphoricarpos sp.), Utah serviceberry *Amelanchier utahensis*), mountain mahogany (*Cercocarpus ledifolius*), rabbitbrush (*Chrysothamnus nauseosus*), rubberweed (*Haplopappus nanus*), Indian ricegrass *(Oryzopsis hymenoides*), needlegrasses (Stipa), bottlebrush squirreltail (*Elymus elymoides*), Sandburg bluegrass (*Poa secund*), and Canby bluegrass (*Poa canbyi*),. Average annual precipitation is above 12 inches.

Pinyon Pine and junipers are most common on hillsides and well-drained soils at moderate elevations. Junipers occur at lower elevations in pure stands, and pinyons can occur in pure stands at the higher elevation limits of this community. Two associations of this community have been mapped, they are:

Pinus monophylla-Juniperus osteosperma (pinyon pine-Utah juniper) association

Juniperus osteosperma (Utah Juniper) association

3.4.1.2 Azonal Communities

Alkali Meadows and Bottomlands. Less than 1 percent of the PVAs are composed of alkaline meadow. These meadows occur on valley bottoms with high water tables throughout the assessment area. Small meadows are rare in the sagebrush community. Existing meadows have experienced heavy livestock grazing and are now dominated by low palatable plants such as western blue-flag (*Iris missouriensis*) and thistle (Circium sp.). Meadows have up to 85 percent grass. Annual precipitation is between 3-8 inches. Plants growing here include: inland saltgrass, alkali sacaton, Baltic rush (*Juncus balticus*), basin wildrye (*Elymus cinereus*), black greasewood, rubber rabbitbrush (*Chrysothamnus nauseosus*), and alkali rabbitbrush. Forbs are generally more common than annuals with the most common genera including; locoweed (*Astragalus* sp.), Indian paint brush (*Castilleja*), buckwheat (*Eriogonum*), lupine (*Lupinus*), and beardtongue (*Penstemon*). Alkaline seeps and springs and playa edges are other habitats dominated by saltgrass. The only association is:

Inland saltgrass (*Distchlis spicata*) alkaline meadow

Riparian Scrub/ Forest. Willows dominate less than 1 percent of the PVAs. Willows occur as scrub, woodland, or thick forests along streams, springs, and at seeps. Typical riparian vegetation species include: aspen, willow species, wild rose, sedge species, rush species, and Kentucky bluegrass.

Riparian areas within the sagebrush scrub are usually dominated by species of willow (Salix). In well-developed riparian areas, gallery forests of Fremont cottonwood (*Populus fremontii*) occur with small thickets of western chokecherry (*Prunus virginiana*) blue elderberry (*Sambucus cerulea)*, and buffalo-berry (*Shepardia argentea*). Only two associations of this community have been mapped, they are:

Salix (Willow riparian scrub/forest) association
Shepardia argentea (silver buffaloberry) association

The lower elevation limits of this community in northern and central Nevada are determined by the presence of saline soils in the valley bottoms. Sagebrush seedlings are not tolerant of saline conditions but sagebrush sometimes descends into the blackbrush scrub along large washes with deep sandy soils.

Grassland. Occasionally grassy bottomlands occur in river bottoms. Tufted hairgrass is fairly common in mountain meadows and springs throughout the western United States. It forms grasslands with some sagebrush, and other grasses such as Nevada bluegrass within the resource area. The only non-alkaline meadow or grassland mapped is:

Deschampsia cespitosa (tufted hairgrass) association

Freshwater Marsh. Emergent water plants dominate along the edges of manmade ponds and drainage ditches. Such areas are usually dominated by cattails (Typha sp.). Cattails can also occur in natural environments along slow moving streams. Cattle often heavily disturb Marshes because cattle spend a large portion of their time near water. The only mapped marsh association is:

Cattail Freshwater marsh

According to Table 3.4.1, the most common plant communities within the resource area are Wyoming sagebrush (24 percent), Shadscale-budsage (19 percent), mountain sagebrush (7 percent), shadscale-bailey greasewood (6 percent), and black greasewood (4.6 percent). The least common are alkali sacaton (0.1 percent), cattail trace, tufted hairgrass trace, shadscale (0.1 percent), horsebrush-four-wing saltbush (0.05 percent), shadscale-boxthorn (0.04 percent), sickle saltbush (0.03 percent) silver buffaloberry (0.03 percent), and willow (0.8 percent). Impacts to these uncommon plant communities may be significant and should be minimized.

3.4.2 Environmental Impacts

3.4.2.1 Proposed Action

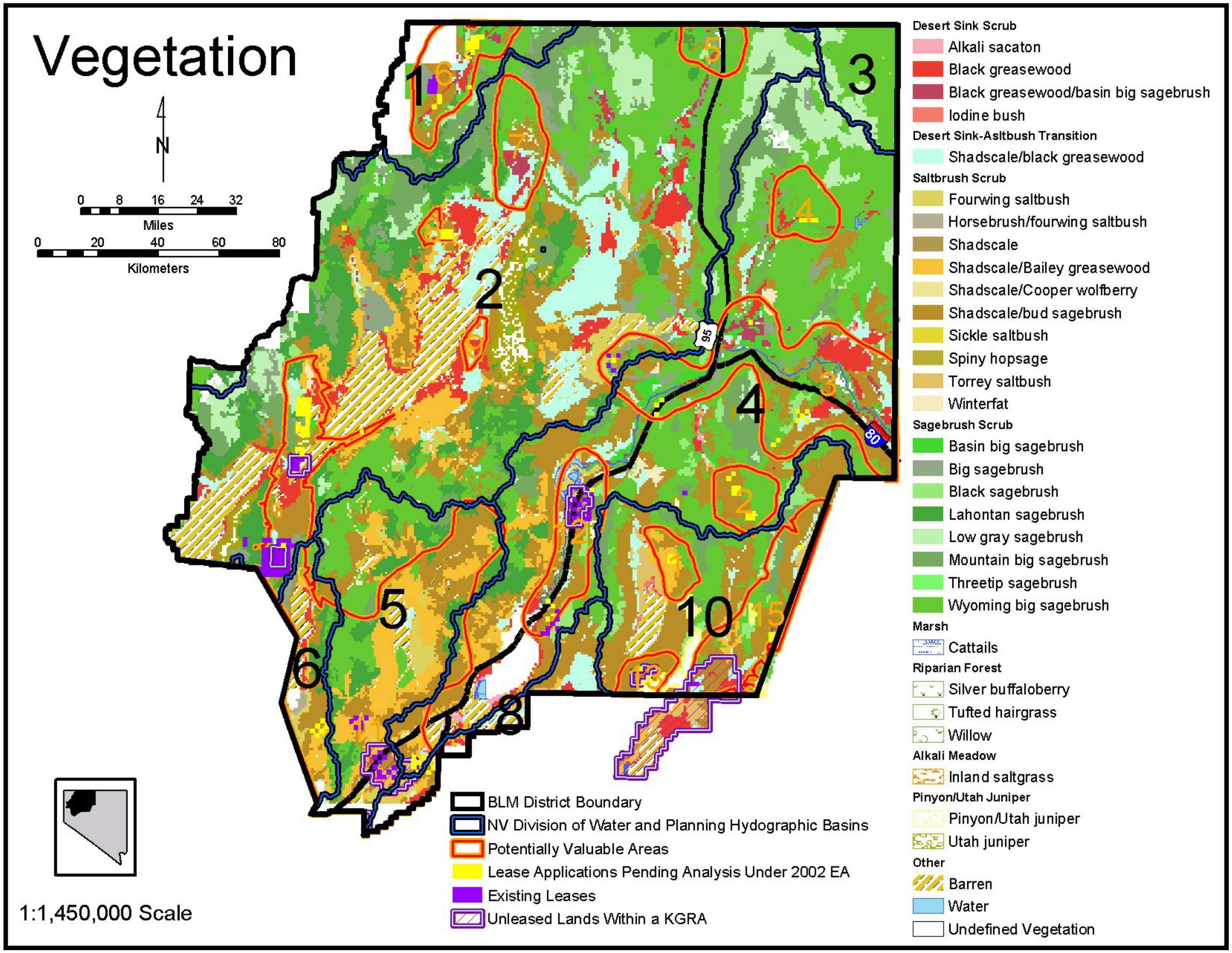
Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," there could be impacts to vegetation resources in the short term due to operational activity and construction. Long-term impacts to vegetation resources could occur due to upgrading of roads and the change in type of vegetation in areas that are reclaimed. Adverse impacts to vegetation from the various phases of geothermal development include crushing or removal of vegetation and changing vegetation composition. Changes in vegetation due to construction could result in the introduction of weedy annual species and pioneering shrub species that would persist with continued disturbance and lack of maintenance.

The following are the potential environmental impacts on vegetation when analyzing the "reasonably foreseeable development scenario."

Exploration. The majority of the geothermal exploration is likely to occur in vegetation zones containing Saltbush Shrub, Desert Sink Scrub, Sagebrush Scrub, Alkali Meadows and Bottoms, and possibly Playas; it is unlikely that developments would occur in Pinion-Juniper woodlands. Impacts on vegetation during exploration phases are expected to be minor, short term, and localized to a small area based on the "reasonably foreseeable development scenario."

FIGURE 3.4-1
ASSESSMENT AREA VEGETATION



Development. The greatest environmental impact on vegetation is expected to occur during the development phase. During this phase development drilling would occur, a mainline road could be constructed, pipelines and access roads would be built, and a power plant and electrical transmission lines constructed. Each of the activities would disturb and remove the vegetation in the affected areas. Damage to vegetation from pipeline corridors is not as severe as from drilling pads. Impacts on vegetation during the development phase would be considered minor and localized to small, however, a somewhat larger area. Seeding disturbed areas would reduce adverse impacts to vegetation.

Production. Vegetation disturbance is expected to be minimal during the production phase. Most, if not all vegetation disturbances would have already occurred. During this phase, which could last up to 40 years, some vegetation in previously disturbed areas could be regenerated and allowed to flourish.

Close-out. Once production terminates and the decision is made to cease operations, the commercial entity would be required to remove all production and support facilities, pipe lines, electrical transmission lines, and return all disturbed areas to their original conditions (as much as possible). As set out in Appendix B, disturbed areas would be reseeded with approved pure live seed mixes. When properly closed out, the vegetation in the previously disturbed areas should resemble that of the surrounding area.

3.4.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.5 Noxious Weeds

3.5.1 Affected Environment

Noxious weeds are defined as non-native invasive plants. They represent a legal classification in which their spread is controlled by the state. Noxious weeds are fast spreading and expensive or difficult to control. When introduced to an area, noxious weeds can quickly dominate the landscape, especially when their populations are uncontrolled. Noxious weeds may proliferate to the point of crowding out other plants that benefit wildlife and domestic animals. Wildlife and grazing animals do not often eat noxious weeds, because their thorns, spines, and a chemical content make them unpalatable.

Noxious weeds are spread from infested areas by people, equipment, livestock/wildlife, and the wind. The potential for additional weed infestations grows along with increased weed populations due to man's activities such as mining, oil and gas exploration, road maintenance, grazing, and recreational use, primarily through off-road vehicle use.

The WFO conducts ongoing inventories of noxious weeds through contract and with office personnel. The purpose of inventory is to document locations of weed infestations so that control and eradication measures can be implemented. This inventory was started in 1997 and is ongoing.

Table 3.5-1 lists the noxious weeds that have been inventoried and found to occur within the WFO.

TABLE 3.5-1
NOXIOUS WEED LIST
(AS OF AUGUST 2000)

Common Name	Scientific Name	Common Name	Scientific Name
Poison hemlock	*Conium maculatum*	Canada thistle	*Cirsum arvense*
Russian knapweed	*Acroptilon repens*	Musk thistle	*Carduus nutans*
Leafy spurge	*Euphorbia esula*	Scotch thistle	*Onopordum acanthium*
Medusahead	*Taeniatherum caput-medusae*	Whitetop or hoary cress	*Cardaria draba*
Perennial pepperweed	*Lepidium latifolium*	Yellow star thistle	*Centaurea solstitialis*
Saltcedar (tamarisk)	*Tamiarix ramosissima*		

Treatments are currently done within the District for Russian knapweed, leafy spurge, perennial pepperweed, scotch thistle, whitetop or horay cress, and yellow star thistle. An increase in funding for noxious weeds would allow treatment of more species, as prioritized from the inventory. Field office specialists set priorities at the beginning of each field season, and treatments are conducted either by contract or by field office personnel certified as pesticide applicators in conjunction with the Nevada Department of Agriculture.

Noxious weeds problems may be reduced by ensuring construction equipment entering the assessment area are cleansed of dirt that may contain noxious weed seeds.

3.5.2 Environmental Impacts

3.5.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the “reasonably foreseeable development scenario,” each project would be evaluated on a case-by-case basis. Native vegetation in localized areas where facilities and utility corridors would be built or constructed could be damaged or destroyed by crushing, exposing roots, soil compaction, and blading for construction. The construction would open areas for weed invasion. The loss of native vegetation could result in the introduction of non-native, undesirable vegetation. During the exploration and development phases, noxious weeds could spread. The degree to which noxious weeds spread would be directly correlated to human activities and weed control efforts in the area. Although natural elements, such as wind and wildlife, would contribute to weed proliferation under this alternative, range animals (livestock and horses) and activities involving off-highway vehicles (OHVs) would contribute to most of the increased weed populations.

The following are the potential environmental impacts on noxious weeds when analyzing the “reasonably foreseeable development scenario.”

Exploration. The exploration process could disturb natural vegetation and increase the potential for weed introduction and spread; however, the small number and sizes of vehicles used, the short duration of exploration activities, and the small areas of disturbance would limit exposure in terms of area and time.

Development. This phase would cause the most extensive disruption to the surrounding environment and would present the greatest opportunity for noxious weed introduction and proliferation. The number and size of construction vehicles and construction activities could lend themselves to transporting noxious weeds to areas where they had not previously existed.

Production. During the production phase, introduction of noxious weeds would be limited primarily to the day-to-day vehicle traffic, traveling to and from the production site and support facilities. However, the new roads in and out of the production area could provide increased opportunities and numbers of non-production related vehicle traffic transiting the area. The potential for noxious weed seed introduction would be proportional to the numbers and types of all vehicle traffic.

Close-Out. The close-out phase would again see an increase in the number of large construction vehicles traveling into and out of the production area. These vehicles could include those involved in earth moving and re-contouring. Unless monitored and controlled, noxious weed seed introduction could increase with these activities. Seed used for re-vegetation must be free of non-indigenous, noxious weeds.

3.5.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.6 LANDS AND REALTY

3.6.1 Affected Environment

3.6.1.1 Land Use and Ownership

The assessment area encompasses approximately 2 million acres of public lands primarily within the WFO but partially within the jurisdiction of the Carson BLM District. Within the entire area there are lands, which are owned in fee on the surface and subsurface by the United States and split estates.[12] Private lands are interspersed with the government lands. The only lands being considered for leasing under proposal are lands on which the BLM has jurisdiction on the surface and the Federal Government has retained the subsurface rights.

Lands within the PVAs are owned and managed by numerous entities/agencies. As stated above, the only lands considered for leasing under this proposal are the public lands managed by the BLM. The breakdown of land ownership and/or use in the assessment area boundaries is as follows:

TABLE 3.6-1
LANDS IN THE ASSESSMENT AREA

Agency/Description	Acres (Percent of Total) (Approximate)
Bureau of Land Management	2,124,000 (67%)
Private	1,017,000 (32%)
Water	16,000 (.5%)
State of Nevada Managed Lands*	6,000 (.2%)
Department of Energy	3,000 (.1%)
Native American Reservation	3,000 (.1%)
Intermittent Water	2,000 (<.1%)
Total	3,171,000

* Bureau of Reclamation withdrawn lands

The assessment areas are traversed by several BLM-permitted utility rights-of-way and access rights-of way. Most permitted uses are non-exclusive to the user; therefore, geothermal exploration and development of these areas would not be prohibited. Mining is a major industry

[12] Split estates are areas where the surface land is owned by one owner, such as a private citizen or corporation, and the subsurface rights are owned wholly or in some cases partially by the United States

in the region with several mines operating under BLM permit. Mining has not created any conflicts in land use with geothermal exploration, development and production in the past and it is not considered to be a factor for the future. Other land uses, in and adjacent to the study area, include grazing, recreation, and resource conservation.

The BLM manages all public lands under its jurisdiction for multiple-use pursuant to the Federal Lands Management Policy Act (FLPMA)[13] and applicable land use plans. In accordance with multiple-use doctrine, geothermal resources lessees are not granted exclusive rights to use the surface lands—the BLM reserves the right to continue operation of existing uses and to authorize future uses. This includes granting new rights-of-way, so long as such new uses are conditioned to prevent unnecessary or unreasonable interference with the rights of the lessee. The potential exists for multiple surface uses while extracting subsurface resources.

3.6.1.2 Land Tenure Acquisition and Disposal

As opportunities arise, the BLM considers acquisition of private lands interspersed with public lands in order to consolidate Federal holdings into a non-disjointed ownership pattern. Conversely, the BLM may dispose of public lands that no longer meet criteria for Federal ownership and management and may be disjointed from other Federal lands. These two processes are collectively known as land tenure adjustment. Lands in the assessment area are unlikely to be a priority for disposal due to the high mineral or geothermal potential and given the criteria set forth in Section 203(a) of FLPMA. Lands that are contiguous with United States lands that may have geothermal development potential may be considered for acquisition if the opportunity arises. The current extent of land acquisition and disposal in the assessment area is minimal.

3.6.2 Environmental Impacts

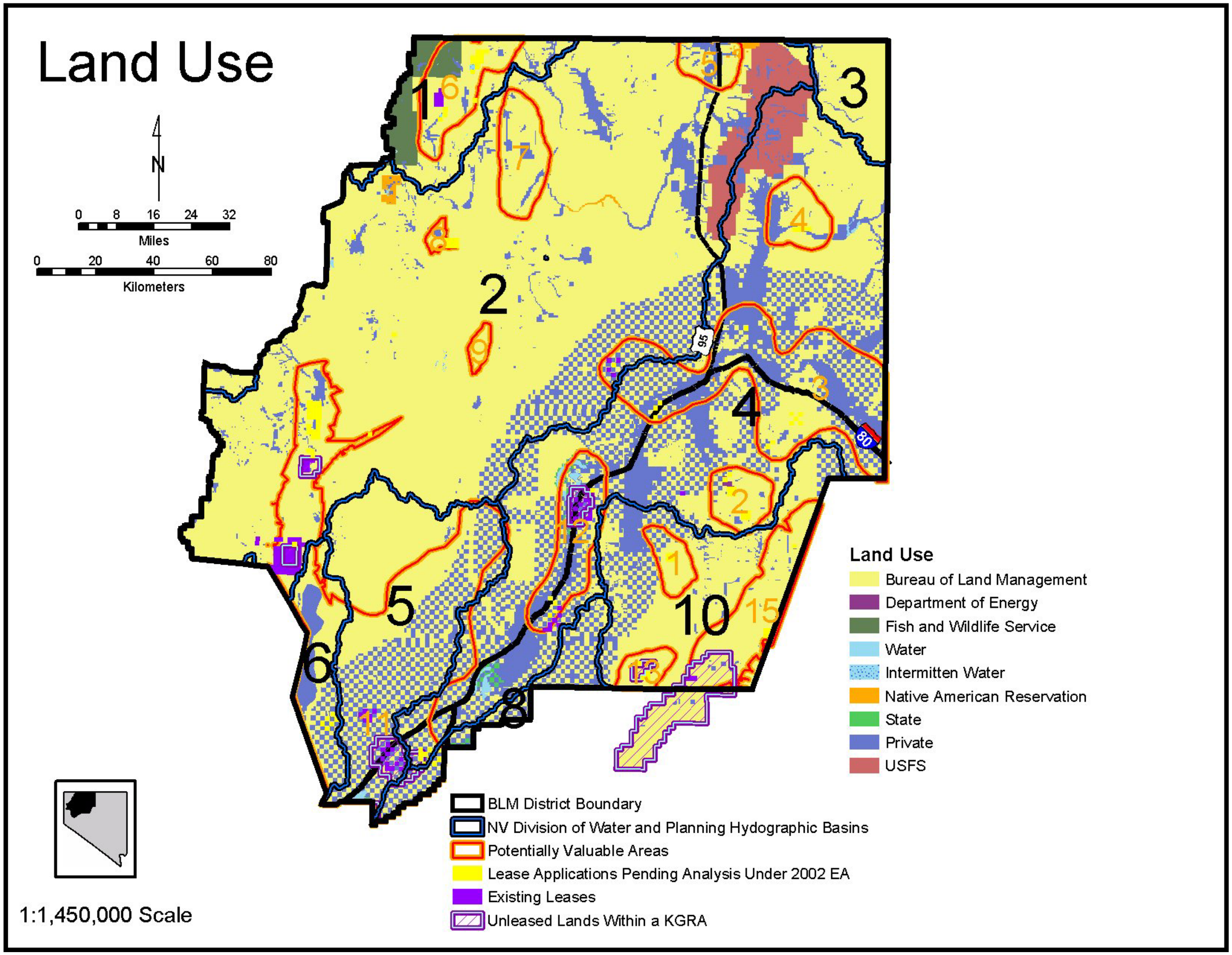
3.6.2.1 Proposed Action

Direct Impacts – Leasing creates a valid existing right, which could affect other future land-use authorizations.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," impacts could occur to existing utility rights-of-way and roads if all or some areas are opened for geothermal exploration and leasing. Existing rights-of-way may need to be relocated to accommodate development of the resources. Granting of new rights-of-way for non-geothermal development would need to take into consideration existing geothermal leases. No other impacts to land use or realty are expected to occur.

[13] Federal Land Policy Management Act (FLPMA) of 1976 (P.L. 94-579 (43 USC §1701) (36 CFR §2310.1-2; 1600 Series))

FIGURE 3.6-1
ASSESSMENT AREA LAND USE



3.6.2.2 No Action Alternative

Direct Impacts – Leasing creates a valid existing right, which could affect other future land-use authorizations.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.7 RECREATION

3.7.1 Affected Environment

A wide variety of outdoor recreation activities occur on BLM-administered lands, including sightseeing, pleasure driving, rock collecting, photography, water sports, winter sports, off-road vehicle use, picnicking, camping, fishing, hiking, bathing in hot springs, and hunting. This wide range of opportunities is possible because virtually all of the public lands are accessible and offer a variety of settings suitable for different recreation activities. Some of these activities may occur on potential geothermal lease areas.

3.7.1.1 Background

With expanded leisure time and growing affluence among the general population, the WFO attracts thousands of visitors annually. The desert and mountains provide the resources necessary for a variety of recreational experiences. These resources provide natural beauty, solitude, and freedom from the structure and regulations of urban areas. In all recreational opportunities, scenic values are often cited as an important resource to the participants' recreational experience. Virtually all recreation activities depend upon availability of access within the resource area. Most visitors travel on some previously used or marked motorized vehicle route. Recreational opportunities are grouped along a continuum of opportunities ranging from intensive vehicle-oriented activities at one end to resource-oriented activities at the other, although there is often overlap between the two.

The popularity of each of the events varies. A list of the most common recreational areas within the assessment area can be found in Table 3.7-1.

TABLE 3.7-1
LOCAL RECREATIONAL VISITATION
(2001)

Number	Resource Area	Annual Visitors
1	WFO Area	104,300
2	Dispersed Black Rock Area*	73,000
3	Pine Forest Recreation Area	8,400
4	Water Canyon Recreation Area	4,000
5	Humboldt Range	2,500
6	Trego Hot Springs	2,400
7	California National Historic Trail	1,900
8	Winnemucca Dry Lakebed OHV	800

Number	Resource Area	Annual Visitors
9	Winnemucca Mountain Trail Bike System	760
10	Various Caves	75

* Most of this area is outside the assessment area

3.7.1.2 Highlights

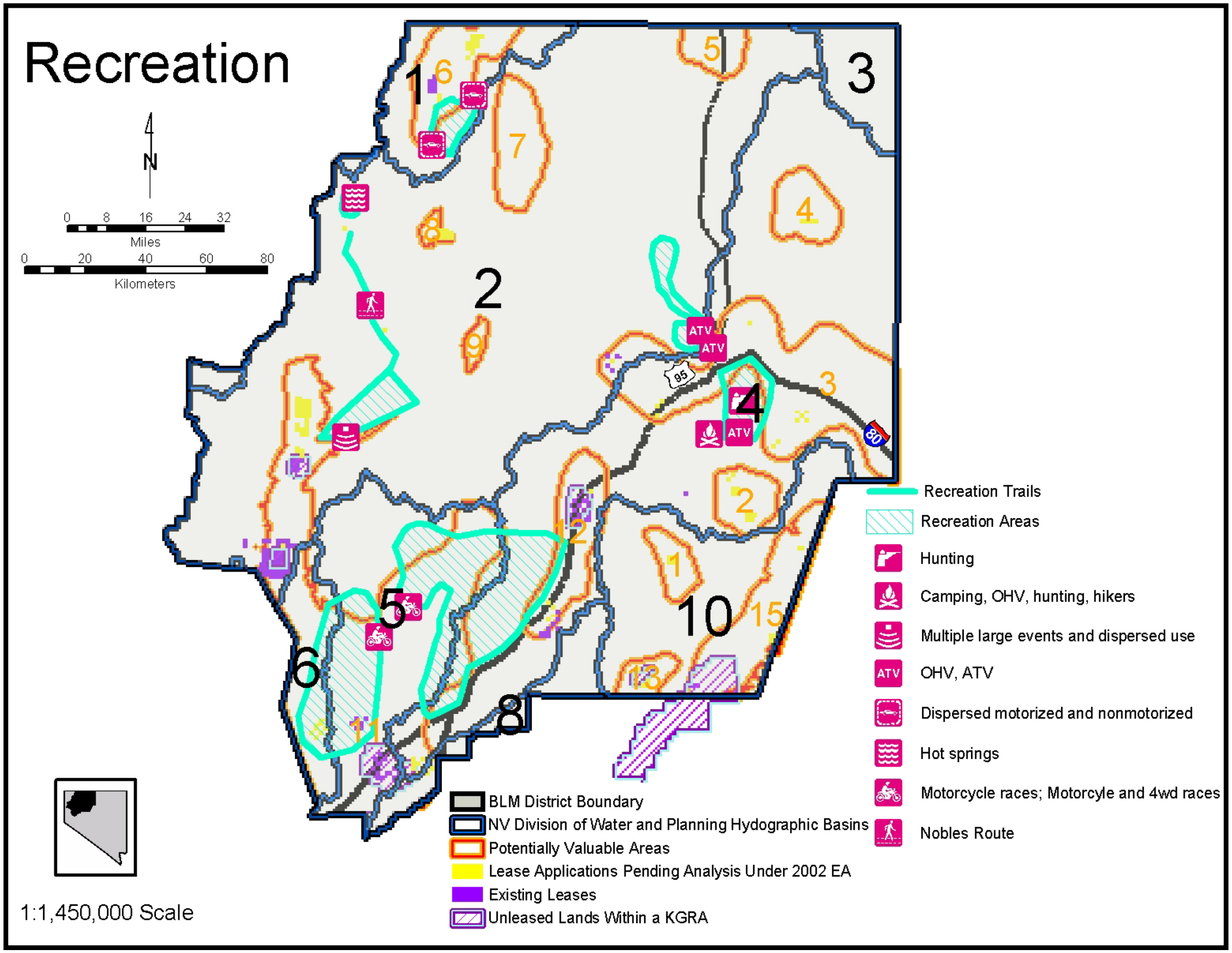
Pine Forest Recreation Area. There are three popular recreation sites within the Pine Forest Recreation Area: Blue Lakes, Onion Reservoir, and Knott Creek Reservoir. All three have high quality scenery, excellent fishing, hunting, wildlife viewing, primitive camping, and mountain biking opportunities. It is a remote area serviced by unpaved roads. This area is located in the Northwest Region (1) and the Black Rock Region (2) Hydrographic Basins. Pine Forest Recreation Area is located between PVA 1 and 2, of which PVA 1 contains pending lease application sites.

Water Canyon. Water Canyon provides Winnemucca residents and visitors cool shade of aspen and cottonwood groves, perennial streams, and a secluded canyon. The primary activities include hiking, jogging, bicycling, all-terrain vehicle riding, horseback riding, picnicking, camping, wildlife viewing, fishing, and hunting. Roads to the ridge tops provide impressive views of adjacent mountain ranges, the Humboldt River, and other valleys. Recent BLM activities included purchasing private inholdings, building a cattle exclosure fence, and protecting the watershed. The primary problems are off-road vehicle use within the watershed, vandalism, woodcutting, littering, health and safety issues, livestock use, shooting, and fire fighting scars. Water Canyon is located within the Humboldt River Basin Hydrographic Region (4). A portion of Water Canyon is located within PVA 7.

Trego Hot Springs Area. Trego Hot Springs, which is located on the southern boundary of the Black Rock Desert-High Rock Canyon Emigrant Trails NCA, has been a popular recreation area for many years. The area mainly attracts visitors from Nevada, California, and Oregon. The majority of users participate in the following leisure activities: bathing, camping, picnicking, and studying nature. Most visitors seem to enjoy the quiet, isolated, primitive setting, which is offered at this rural location. While Trego Hot Springs is located outside of the assessment area near PVA 8, many of the recreational activities associated with visits at the hot springs occur within PVA 8.

There are two large disperse motorcycle use areas located in the southwestern portion of the assessment area, west of Lovelock. These OHV-use areas are located within the Humboldt River Basin (4), the West Central Region (5), and the Truckee River Basin (6). The majority of these two areas are located within PVA 8, with a small portion in PVA 9.

FIGURE 3.7-1
ASSESSMENT AREA RECREATION MAP



3.7.2 Environmental Impacts

3.7.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," impacts to recreation activities in the assessment area are likely to be minimal. Loss of surface water quantity and quality could keep the public from bathing in the hot springs. In addition, production facilities, support facilities, and/or security fencing could also limit public access to hot spring bathing areas. Any development near Trego Hot Springs could adversely affect recreation experiences for thousands of visitors each year.

The following are the potential environmental impacts on recreation when analyzing the "reasonably foreseeable development scenario."

Exploration. During the exploration phase, survey and drilling crews are likely to use the available access roads and trails in the area that are also used for recreation access. Due to increased use, temporary delays could result. The survey activities conducted during the exploration phase are likely to only minimally impact recreation, if at all, due to the short duration, small crew size, and temporal nature of the surveys and drilling wells.

Development. The development stage includes intense construction activities. At this time access roads, well pads, pipelines, transmission lines and power plants are constructed. Increased truck traffic during the construction phase could affect recreation due to increased noise and dust levels and could cause temporary delays or closures on access roads. Construction sites are likely to have limited access to the public, slightly decreasing access to the area for recreation.

Production. The production stage includes operation and maintenance of the constructed facilities. These activities require a small number of employees who would require use of access roads in the area but are not likely to limit the recreational use of these roads. The geothermal power plant and facilities are likely to have limited access to the public, therefore slightly decreasing access to the area for recreation. Development could preclude access for recreational use of hot springs.

Close-Out. The close-out stage involves abandonment of the site after production has ceased. Close-out activities would require a small crew to remove equipment, cap wells and rehabilitate the disturbed area. This crew would require use of access roads in the area but are not likely to limit the recreational use of these roads. Due to the short duration of activities and small crew size close-out activities are not likely to affect recreation.

3.7.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.8 VISUAL RESOURCES

3.8.1 Affected Environment

3.8.1.1 Visual Resource Management

The BLM initiated visual resource management (VRM) during planning processes to manage the quality of the landscape and minimize potential impacts to visual resources resulting from development activities. In determining VRM class designations, the inventory process considers the scenic value of the landscape, viewer sensitivity to the scenery, and the distance of the viewer to the subject landscape. These management classes identify various permissible levels of landscape alteration, while protecting the overall visual quality of the region. Management classes are divided into four levels (Classes I, II, III, and IV), with Class I designated as most protective of the visual resources (see Table 3.8-1). The objectives of these classes vary from very limited management activity to activity that allows major landscape modifications.

TABLE 3.8-1
BLM VISUAL RESOURCE MANAGEMENT CLASSES

Visual Class	Description
I	Objective: Preserve existing landscape character. This class provides for natural ecological changes. It does not, however, preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
II	Objective: Retain existing landscape character. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract a casual observer's attention. Any changes must repeat the basic elements of line, form, color and texture found in the predominant natural features of the characteristic landscape.
III	Objective: Partially retain existing landscape character. The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate a casual observer's view. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	Objective: Provide for management activities that require major modification of the existing landscape character. The level of change to the characteristic landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. Every attempt, however, should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic landscape elements.

Source: BLM Manual Handbook 8410-1 (USDI 1986)

Although site-specific development plans are not identified in the proposed action, each future proposed project in leased areas would be evaluated for its impact to visual resources. Management classes are utilized to identify minimum impact levels to the visual resource when a proposed development action is analyzed using the Bureau's Visual Contrast Rating System.[14] By using this system, the impact magnitude to visual resources can be measured by separating the landscape into its major features (landform, vegetation, and structures) and predicting the magnitude of change to each of the basic visual elements (line, form, color, and texture) within each of the features. Visual analysis for proposed projects on leased areas within the assessment area would be conducted using Key Observation Points, which are locations from which a proposed project can be seen.

Once potential impacts to visual resources have been identified for each location, visual design considerations would be incorporated into proposed surface-disturbing projects on a case-by-case basis. Mitigation measures, using the following design techniques, would be developed for each site to minimize adverse impacts to visual resources and to maintain the appropriate VRM class:

- Site locations to minimize adverse affects
- Minimize disturbance during construction
- Repeat form, line, texture, and color in the design elements
- Color selection for exterior building materials
- Sensitive grading to minimize variations in natural topography
- Appropriate reclamation and restoration during project closure
- Linear alignment in design

3.8.1.2 Description of the Assessment Area

The assessment area consists of approximately 2 million of the 8.3 million acres of the public lands managed by the BLM Winnemucca Field Office and consists of PVAs, KGRAs, and lease application sites. Visual resources within the assessment area are currently managed based on inventories completed in the late 1970s (see Figure 3.8-1). No lands are classified as VRM Class I within the assessment area. Approximately 6 percent of the assessment area occurs in VRM Class II, approximately 10.6 percent of the assessment area is VRM Class III, and approximately 83 percent of the assessment area is located in VRM Class IV (see Table 3.8-2).

Dixie Valley KGRA. The CCFO has not assigned final VRM Management Classes to the affected areas within its administration area. The potentially affected lands within Dixie Valley are managed as Class III (Callan, 2002).

[14] BLM Visual Resource Management Inventory and Contrast Rating Manuals 8410-1 and 8432-1.1

FIGURE 3.8-1
ASSESSMENT AREA VISUAL MAP

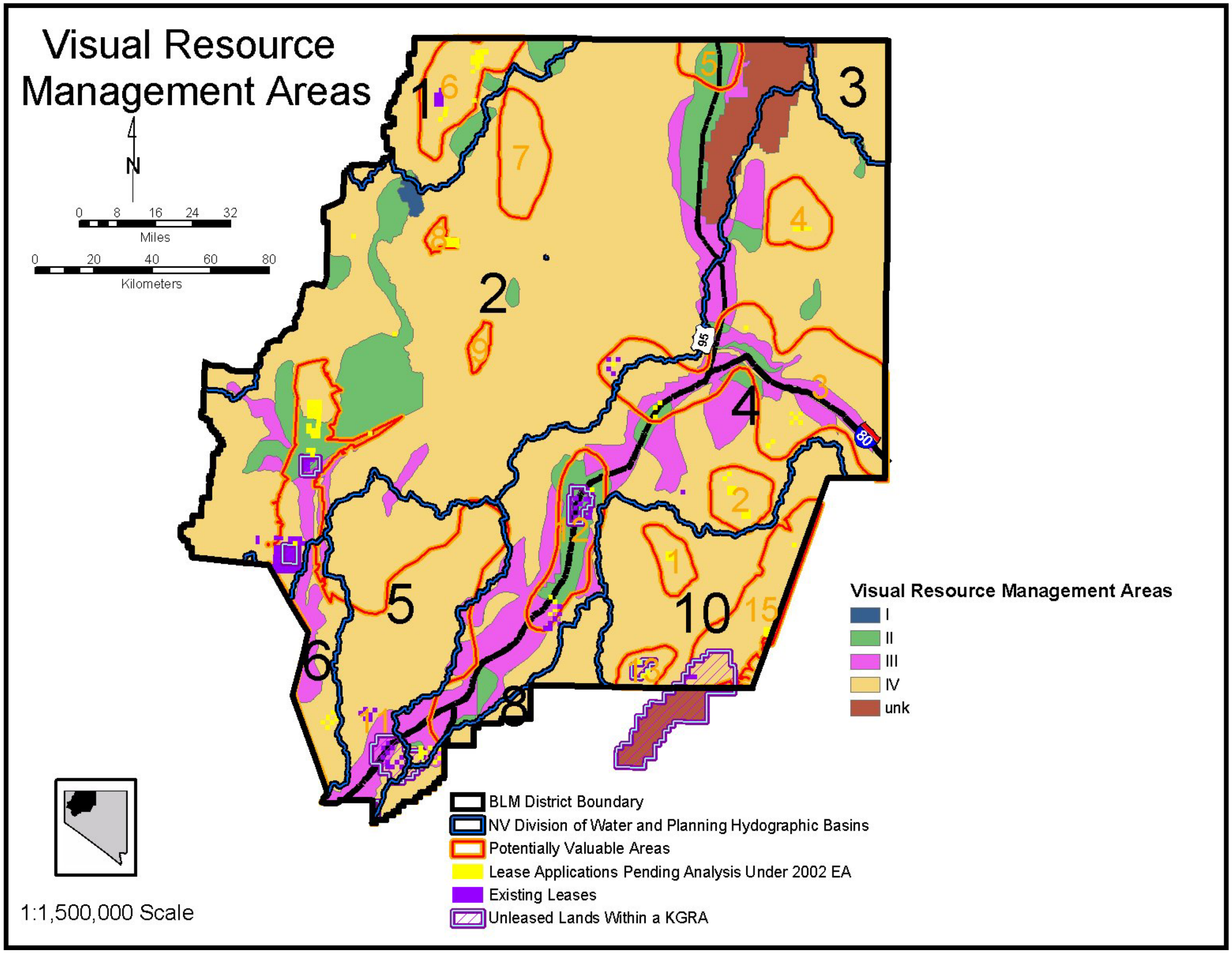


TABLE 3.8-2
ACREAGES OF VISUAL RESOURCE MANAGEMENT CLASSES BY PROSPECTIVELY VALUABLE AREA

PVA	Class II	Class III	Class IV	Total Acreage*
1			50,600 (2.4%)	50,600
2			79,200 (3.8%)	79,200
3	16,100 (.8%)	78,300 (3.8%)	224,700 (10.8%)	319,100
4			75,500 (3.6%)	75,500
5	23,700 (1.1%)	7,200 (.3%)	15,200 (.7%)	46,100
6	18 (Trace)		134,800 (6.5%)	134,800
7			129,600 (6.2%)	129,600
8			14,300 (.7%)	14,300
9			21,100 (1.0%)	21,100
11	60,500 (2.9%)	136,700 (6.6%)	644,200 (31.0%)	841,400
12	40,100 (1.9%)	25,800 (1.2%)	9,400 (.5%)	75,300
13			50,200 (2.4%)	50,200
15			239,400 (11.5%)	239,400
Total	140,400 (6.8%)	248,000 (11.9%)	1,688,200 (81.3%)	2,076,600

NOTE: There are no VRM Class I resources in the assessment areas
* Acreages are approximate and may extend beyond the assessment area boundaries

Private, state, and other lands are included within the management classes solely for ease of delineation of the classes on maps. However, the BLM has no jurisdiction over these lands. Development of these non-public lands could have an impact on the visual environment of adjacent public lands.

The assessment area is located within the northern Basin and Range physiographic province. Basin and range landscapes in northern Nevada are characterized by elongated, generally north-trending mountain ranges separated by broad, open basins. This type of landscape allows for long viewing distances.

The dominant natural features within the assessment area include steep rugged mountains; volcanic highlands and table lands; expansive valleys; dune fields; springs (hot and cold); streams; the Humboldt, Little Humboldt and Quinn Rivers; and associated floodplains and marshes. Man-made features include: emigrant trails, ranches, fences, irrigated and cultivated fields, power plants (two geothermal and one coal), power lines, utility corridors, Interstate-80, other main and secondary roads, OHV trails, railroads, large open pit mines, gravel pits, small dams along the river, one large dam at Rye Patch Reservoir, repeaters, satellite dishes, communication towers, and radio towers.

A large portion of the assessment area (PVA numbers 7, 9, and the southern part of 8) is located along the Humboldt River and Interstate-80 corridors. This region contains the highest concentration of man-made features. Several towns are situated along this corridor including Valmy, Golconda, Winnemucca, Mill City, Imlay, Rye Patch, Oreana, and Lovelock. PVA numbers 1, 5, and the northwest of 8 are located in more remote areas along major secondary routes and include the towns of Denio, McDermitt, Empire, and Gerlach. These areas contain typical small community developments and facilities. The remaining PVAs are located in very remote locations where man-made features are predominantly ranch settings and access roads.

Ranch settings typically include small dwellings, outbuildings, barns, fences, trees, corrals, and fields. They are all situated on private lands, and only the larger features are visible from a distance. Newer buildings painted with light colors contrast with background landscapes. The ranches have been there for many years, and the structures tend to be weathered, blending in with the surroundings.

The mines in the area vary from highly visible to slightly visible depending on viewing distance and location. Large open pits, waste rock dumps, heap leach pads, and access and haul roads to the pits are the most visible distance features of mines.

Private residences on private lands are visible from a distance when traveling along local roads. Color contrasts between the private structures and the surrounding landscapes account for the high visibility.

3.8.2 Environmental Impacts

3.8.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the “reasonably foreseeable development scenario,” indirect impacts would probably not meet the criteria of VRM Class II areas. The impacts in Class III areas would probably range from severe to light, depending on the amount of development and the proximity to high-use areas. Indirect impacts in Class IV areas could be relatively minor. Potential adverse impacts to visual resources from long-term developments and facilities, such as power lines and communication sites, would be characterized in a site-specific EA and mitigated on a case-by-case basis to minimize impacts to visual resources. Mitigation measures would beneficially impact all landscapes and serve to protect the expansive scenic vistas. Depending upon the type of development lease approved, those developments that would abut the National Conservation Area, wilderness, and wilderness study areas could have an impact on the visual resources of those protected areas.

The following are the potential environmental impacts on visual resources when analyzing the "reasonably foreseeable development scenario."

Exploration. Direct impacts to the landform, vegetation and structural features of the characteristic landscape could occur during the exploration phase; however, these effects would usually be of short duration and localized to a small area. Drilling would temporarily impact the landscape, introducing new line, color, form and texture elements into the landscape. Brightly colored drill rigs and supporting facilities would be visible to visitors. Disturbances to soils and vegetation from drilling and seismic operations could be seen for longer periods of time.

Development. During the development phase, construction of roads, drill pads, pipelines, power plants and power lines would result in long term modifications to the line, form, color, and texture of the characteristic landscape. Roads, drill pads and pipelines create strong horizontal linear contrasts. Vegetation and soil removal create color, textural, and linear contrasts with adjacent areas that could be highly visible long after all the drilling and development facilities were removed. Constructed structures would have strong geometric and linear shapes, and solid colors, all contrasting with the natural landscapes and continuing throughout the life of the project.

Production. Throughout the life of the project all of the impacts described in the exploration and development phases would exist. Additional pipelines, wells, roads, and structures would result in more surfaces being disturbed, and increased modifications to the landscape would continue.

Close-out. If the project is completely shut down and reclaimed, modified landscapes would be rehabilitated, and the visual impacts would diminish with time. It can take several years for disturbed areas to return to a natural appearance. In some cases there could be lingering evidence of the disturbances. If the project is not completely shut down, the impacts could continue indefinitely.

3.8.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.9 WILDLIFE, MIGRATORY BIRDS, AND FISHERIES

3.9.1 Affected Environment

3.9.1.1 Wildlife and Migratory Birds

The wildlife present in the assessment area are those species which are identified to specific habitat types. The valley bottoms have predominately greasewood (*Sarcobatus spp.*) and shadescale (*Atriplex confertifolia*) communities. The valley bottoms are normally drier sites and have numerous small mammals, lizards, reptiles, and non-game birds. The mid-elevations along alluvial fans are dominated by Wyoming big sagebrush (*Artemisia Tridentata Wyomingensis*), and bunchgrass sites. The higher elevations are a mosaic of mountain big sagebrush (*Artemisia vaseyana*), mountain mahogany (*Cercocarpus ledifolius*), low sagebrush (*Artemisia vaseana*), and bunchgrass sites with numerous mountain brush inclusions. The precipitation is normally highest at the upper elevations. Interspersions of juniper (*Juniperus occidentalis*), quaking aspen (*Populus tremula tremuloiudes*), and service berry (*Amelanchier spp.*) occur at special ecological sites.

Big game species of California bighorn sheep (*Ovis canadensus california*) normally use rugged mountain tops and side slopes; desert bighorn sheep (*Ovis canadensis nelsonii*) normally use lower elevation rimrock and rock outcroppings; mule deer (*Odocoileus hemionus*) use upper elevations and mountain side slopes; and pronghorn antelope (*Antilocapra americanana*) normally use any elevations which have short vegetation. Each of these big game species have their preferred habitat; however, high snow events and wildfires each cause wildlife to move to lower elevations or to non-burned sites.

Several mammalian predators occur in the assessment area. Mountain lions (*Felis concolor*) normally prefer mountaintops and side slopes where the prey base is located. Bobcats (*Lynx rufus*) will be found in sagebrush communities and mountainside slopes. Coyotes (*Canis latrans*) may be found anywhere but are more common in sagebrush communities. Weasels (*Mustela spp.*) are found wherever small mammals are found. Gray fox (*Urocyon cinereoargenteus*) are usually found associated with pinyon pine (*Pinus edulis*)/juniper woodlands while kit fox (*Vulpes macrotis*) are found at lower elevations.

Several small mammals are common including the desert cottontail rabbit (*Sylvilagus auduboni*), blacktail jackrabbit (*Lupus californicus*), and several species of bats and ground squirrels. The assessment area also has numerous raptors, amphibians, and reptiles.

Migratory birds may be found either as seasonal residents or as migrants. Executive Order 13186, titled "Responsibilities of Federal Agencies to Protect Migratory Birds," was signed on October 1, 2001 to enhance and ensure the protection of migratory birds. All birds in the assessment area are neotropical migratory birds except for all the Gallinaceous birds (California quail, sage grouse, chukar partridge, gray partridge, ring-necked pheasant, mountain quail, and sharp-tailed grouse). Sage grouse are located throughout the assessment area, and over time have generally experienced a decline in population numbers. In August 2001, the Nevada

Governor established a Sage Grouse Conservation Team as part of the Nevada Sage Grouse Conservation Project for conserving and protecting Nevada's sage grouse and their habitat.

3.9.1.2 Fisheries

Fishery resources within the assessment area consist of both non-game and game species (see Table 3.9-1). Large elevation changes and varying amounts of precipitation are common throughout the district, which allows for over 875 miles of lotic systems (streams) and several thousand acrea of lentic systems (springs, seeps, wet meadows, and lakes). Habits for both non-game and game species occur in both lentic and lotic systems found in the district. Although several game species thrive in northern Nevada, only one game species, the Lahontan cutthroat trout (*Oncorhynchus mykiss*), is native to the region. Other game species include: brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykss*), and brook trout (*Salvelinus confluentus*).

Game or sport fish in northern Nevada can be generally categorized as "warm water" (e.g., bass catfish, etc.) or "cold water" fish (i.e., trout). Warm water fish are most likely to occupy reservoirs, larger springs, and higher order streams on valley-floors, and cold water fish are mostly restricted to cold springs and low order, mountain streams. Table 3.9-1 categorizes warm and cold-water fish within the assessment area, and Table 3.9-2 shows aquatic habitat types that are believed to occur within each PVA/KGRA. Additional surveys are necessary to determine species and aquatic habitats that may be affected by geothermal development within each KGRA/PVA.

TABLE 3.9-1
SPORT FISH

Common Name	Scientific Name	Common Name	Scientific Name
Black bullhead[2]	*Ictalurus melas*	Largemouth bass[2]	*Micropterus salmoides*
Black crappie[2]	*Pomoxis nigromaculatus*	Northern pike[2]	*Esox lucus*
Bluegill[2]	*Lepomis macrochirus*	Rainbow trout[1]	*Oncorhynchus mykiss*
Brook trout[1]	*Salvelinus confluentus*	Redear sunfish[2]	*L. microlophus*
Brown bullhead[2]	*Ictalurus nebulous*	Sacramento perch[2]	*Archoplites interruptus*
Brown trout[1]	*Salmo trutta*	Smallmouth bass[2]	*M. dolomieui*
Channel catfish[2]	*Ictalurus punctatus*	Walleye[2]	*Stizostedion vitreum*
Common carp[2]	*Cyprinus carpio*	White catfish[2]	*Ictalurus catus*
Green sunfish[2]	*L. cynellus*	White crappie[2]	*P. annularis*
Lahontan cutthroat trout[1]	*Oncorhynchus clarki henshawi*	Yellow perch[2]	*Perca flavescens*

[1] Denotes cold-water fish
[2] Denotes warm-water fish

The U.S. Fish and Wildlife Service (USFWS) listed the Lathontan cutthroat trout as threatened in 1975 under the Endangered Species Act (ESA) of 1973.[15] Its distribution is summarized in Table 3.9-2.

TABLE 3.9-2
AQUATIC HABITAT TYPES

PVA/KGRA	Potential Aquatic Habitat Types
1	Spring
2	Spring and stream
3	Spring
4	Spring
5	Stream
6	Stream and spring
7	River, stream, marshland, and spring
8	Spring and stream
9	River, reservoir, stream, marshland and spring
10	Spring
11	Spring and stream
12	Spring
13	Marshland and spring
Gerlach	Marshland and spring
Brady	Thermal spring
San Emidio	None
Dixie Valley	Marshland and spring

TABLE 3.9-3
LATHONTAN CUTTHROAT TROUT
RECOVERY AREAS IN THE ASSESSMENT AREA

Black Rock Desert Basin	
Current or Recent Existing Populations	
Summit Lake	Snow Creek
Mahogany Creek	Upper Leonard Creek
Summer Camp Creek	

[15] Endangered Species Act of 1973 (P.L. 93-205 as amended (16 USC §1531 *et seq.*)

Potential Sites	
Chicken Creek	Cold Springs Creek
North Fork Battle Creek	Red Mountain Creek
Big Creek, Pine Forest Range	Raster Creek
Happy Creek	Bartlett Creek
Mary Sloan Creek	Paiute Creek
Rodeo Creek	Jackson Creek
Granite Creek	Donnelly Creek
Colman Creek	Cottonwood Creek
House Creek	Log Cabin Creek
Quinn River Basin	
Current or Recently Existing Populations	
Sage Creek	South Fork Flat Creek
Line Canyon Creek	Indian Creek
Washburn Creek	Rock Creek, Montana Range
Crowley Creek	East Fork Quinn River
Riser Creek	Rebel Creek
Eight-mile Creek	
Potential Sites	
Andorno Creek	Cottonwood Creek
McDermitt Creek	Ten Mile Creek
Flat Creek	
Humboldt River Basin	
Current or Recently Existing Populations	
South Fork Little Humboldt River	South Fork Indian Creek
Pole Creek	Able Creek
Indian Creek	North Fork Little Humboldt River
Rock Creek, Sonoma Range	

Source: Recovery Plan for the Lahontan Cutthroat Trout, January 1995, U.S. Fish and Wildlife Service - Region 1, Portland, Oregon

3.9.1.3 Other Biota

The assessment area could have several species of algae, bacteria, fungus, molds, yeast, invertebrates, and/or other small plants occupying warm geothermal springs and/or other surface expression.

No inventories or surveys have been completed for the assessment area to date; however, over time species surely have adapted to the geothermally-heated water ecosystem and could be important to science, biodiversity, and the existence of each species.

3.9.2 Environmental Impacts

Wildlife and Migratory Birds. Geothermal development could affect wildlife and migratory birds in a variety of direct and indirect ways. While a substantial amount of additional work is necessary to determine the distribution and demography of populations that could be affected by the proposed action, information gathered from other geothermal developments and knowledge of the environmental consequences of habitat alteration and pollutants provides sufficient information to assess potential impacts. Potential impacts are summarized below, but a more thorough analysis of how individual wildlife and migratory bird species would be affected by activities that are associated with developing each KGRA/PVA would be assessed during site-specific EAs that would be prepared for each lease.

Environmental effects of geothermal resource development are similar to other activities affecting terrestrial habitat, and surface and groundwater. While each species would respond differently to various impacts, all of them could be affected by activities that alter the thermal, physical, or chemical characteristics of their habitats. Physical habitat alteration could result from on-site facility construction, road and power line construction. Impacts of groundwater removal could affect spring and stream discharge (which could modify physical, chemical, and thermal characteristics of aquatic habitats), and alter the thermal characteristics of soils. Surface discharge of thermal waters could also affect chemical and thermal characteristics of habitats that are important to terrestrial and aquatic communities. In addition, geothermal development at various stages could disrupt big game movement corridors.

Avian species could be most affected by direct and indirect influences of power line construction, operation, and maintenance, and include constructing roads, building towers, and stringing high-tension power lines. Potential direct effects include habitat alteration and fragmentation, modification of thermal and chemical characteristics of surface waters that could affect riparian vegetation that is used for nesting and foraging, and mortality from electrocution when power lines are used for roosting. Geothermal development could adversely impact breeding, nesting, and brood-rearing habitat for sage grouse by removal of vegetation and destruction of areas during construction. Indirect effects are largely attributed to increased human activity, which could displace individuals or reduce nesting success of species that are sensitive to disturbance. Road construction could also increase access into areas that are currently remote and provide for additional legal and illegal take.

Species associated with larger aquatic habitats (e.g., aquatic, marshland, and riparian species) could be adversely affected by increased activity in riparian systems (e.g., road construction, disturbances that increase erosion, etc.) and by changes in water quality that could be associated with surface release of geothermal water or construction materials. Spring-dwelling species could also be affected by these factors in addition to alterations in discharge and thermal characteristics that could occur with groundwater removal. Some small and immobile species could suffer direct mortality due to construction activities.

Fisheries. Fisheries resources that could be affected differ among PVAs/KGRAs, and effects of development on these resources would be assessed in site-specific EAs prepared for individual PVAs and KGRAs. Fisheries resources occupying larger aquatic habitats (e.g., streams, rivers, reservoirs, and marshlands) could be adversely affected increased activity in riparian systems (e.g., road construction, disturbances that create barriers to movement, increase erosion, sedimentation, reduce habitat heterogeneity, etc.) and by degrading water quality (thermal or chemical) or quantity. Spring-dwelling populations could be affected by these factors in addition to alterations in discharge and thermal characteristics that could occur as a result of groundwater extraction. Road construction could also increase access into areas that are currently remote, which could allow additional legal and illegal take of sport fish. Increased access could also result in unwanted introductions of non-native species into remote habitats.

Other Biota. Loss of surface expression of a hot spring could destroy populations of endemic invertebrate species. Spills, drill fluids, and well testing, could adversely impact water quality and which could be toxic. Impacts to endemic species would be minimized through avoidance and developing appropriate stipulations.

3.9.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," there would be minor environmental impacts concerning wildlife, migrating birds, or fisheries. Using an updated PEA as the guideline for new leases would more adequately provide the level of protection required to ensure that these biological resources are protected under current Federal and State statutes.

The following are the potential environmental impacts on wildlife, migratory birds, and fisheries when analyzing the "reasonably foreseeable development scenario."

Exploration. The environmental impacts on wildlife, migratory birds, and fish are expected to be short-lived and restricted to small geographical areas during the geothermal energy exploration phase. Displacement of wildlife and migratory birds is not expected to make significant long-term changes to habitat or animal/bird life styles. The greatest short-term impacts would occur during traditional calving of large game animals and migratory birds nesting periods, should physical destruction of nesting sites and associated habitat occur through the various phases of development. Other exploration impacts include drilling residue and/or extracted water being released into streams or lakes.

Development. The development phase would be very similar to the exploration phased though it would be expected to last somewhat longer and create more disruption to wildlife, migratory birds, and fish populations.

Production. During the production phase, long-term effects could occur to wildlife, migratory birds and sport fish depending on where the permanent facilities are located and electrical power transmission lines are built. Production would cause greater long-term impacts to big game habitat and corridors. With production lasting up to several decades, these effects would be long lasting; however they would be restricted to small geographical areas. It is expected that wildlife would quickly adjust to the commercial development and be able to cohabitate with minimum disruption to wildlife life styles.

Close-Out. Close-out of a developed geothermal production operation could cause short-term changes to wildlife and migratory bird activity due to increased dismantling activity and noise. Once the commercial activity has been closed-out and returned to its original, natural configuration, wildlife and migratory bird rehabitation is expected to occur over a very short period of time. This would depend on the speed of regrowth of cover and forage.

3.9.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.10 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

3.10.1 Affected Environment

A number of Federal and State threatened, endangered, or special status species occur throughout northern Nevada. Any action that could affect a Federally-listed species is subject to consultation with the USFWS pursuant to Section 7 of the Endangered Species Act (ESA) of 1973.[16] For special status species (e.g., candidate, and/or species of concern), BLM policy (6840.02 B) is to not authorize actions that could adversely affect their populations and thus contribute to listing any of these species under provisions of the ESA. BLM also signed a Memorandum of Understanding with the U.S. Geological Survey, U.S. Department of Agriculture Forest Service, Smithsonian Institution, U.S. National Park Service, USFWS, and The Nature Conservancy (signed November 6, 1998) to conserve springsnail species throughout the Great Basin. On May 13, 2002, the USFWS provided BLM with a list of Federally threatened, endangered, candidate, and species of concern that could occur within areas affected by the proposed action.

Species on the USFWS list occupy a variety of habitat types and few of them occur throughout the assessment area. Table 3.10-1 includes all Federally-listed threatened and endangered species; Table 3.10-2 includes all proposed threatened and candidate species, and Table 3.10-3 lists all species of concern. These tables also list other rare species known from the assessment area, identify broad, salient habitat features required by each species, and identify hydrographic basin(s), PVAs, and KGRAs where geothermal development is most likely to affect their abundance and distribution. These tables are not intended to provide definitive ecological or distributional information that is necessary to thoroughly assess the impacts of the proposed action on each taxon, but are intended to provide a framework for this assessment, to identify where species could be affected, and to indicate the types of habitat that are occupied by each species. Additional surveys could determine that species are found in or near additional hydrographic basins, PVAs, and KGRAs.

[16] Endangered Species Act of 1973 (P.L. 93-205 as amended (16 USC §1531 *et seq.*))

TABLE 3.10-1
THREATENED AND ENDANGERED SPECIES

Common Name	Habitat	Hydrographic Basin	PVA	KGRA
3.1.1.1 Endangered Species				
Bald eagle[1] *(Haliaeetus leucocephalus)*	Primarily winter resident; nesting sensitive to disturbance	All	All	All
3.1.1.2 Threatened Species				
Desert dace[2] *(Eremichthys acros)*	Thermal springs, insectivorous	2		
Lahontan cutthroat trout[3] *(Oncorhynchus clarki henshawi)*	Lower elevation and lower gradient perennial streams, high quality water, gravel substrate and pools	1, 2, 4	1, 2, 6	

[1] Herron et al. 1985; Ryser 1985
[2] Hubbs and Miller 1948; Vinyard 1996
[3] USFWS 1995

TABLE 3.10-2
PROPOSED THREATENED AND CANDIDATE SPECIES

Common Name	Habitat	Hydrographic Basin	PVA	KGRA
Proposed Threatened Species				
Mountain plover[1] *(Charadrius montanus)*	Neo-tropical migrant, scarce in Great Basin, grassland breeding habitat	1,2, 4, 8, 10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	Rye Patch, Brady, New York Canyon, Dixie Valley
Candidate Species				
Western yellow-billed cuckoo[2] *(Coccyzus americanus)*	Riparian vegetation, summer resident for nesting			

1 Graul 1975; Graul and Webster 1976
2 Ryser 1985

TABLE 3.10.3
SPECIES OF CONCERN

Common Name	Habitat	Hydrographic Basin	PVA	KGRA
Species of Concern				
Pygmy rabbit[1] *(Brachylagus idahoensis)*	Sagebrush shrub	All	All	All
Pacific Townsend's big-eared bat[1] *(Corynorhinus townsendii townsendii)*	Associated with caves and mines from 600-11,000 feet. Pinyon-juniper, sagebrush and salt desert shrub, agriculture lands	All	All	All

Common Name	Habitat	Hydrographic Basin	PVA	KGRA
Pale Townsend's big-eared bat[1] *(Corynorhinus townsendii pallescens)*	Associated with caves and mines from 600-11,000 feet. Pinyon-juniper, sagebrush and salt desert shrub, agriculture lands	All	All	All
Spotted bat[1] *(Euderma maculatum)*	Associated with cliffs from 600-7,000 feet. Coniferous forest, sagebrush and riparian habitats	1, 2, 5	1, 8	Gerlach, San Emidio
Small-foot myotis[1] *(Myotis ciliolabrum)*	Elevations 1,500-6,000 feet. Associated with caves, mines and trees. Pinyon-juniper woodlands, sagebrush and desert shrub, grasslands, agriculture lands	All	All	All
Long-eared myotis[1] *(Myotis evotis)*	Primarily forest and sagebrush shrub from 2,000-10,000 feet.	All	All	All
Fringed myotis[1] *(Myotis thysanodes)*	Scarce in northern NV, primarily coniferous forest and desert brush shrub from 1,500-7,000 feet.	2, 5, 8,10	8, 12, 13	Brady, Dixie Valley
Long-legged myotis[1] *(Myotis volans)*	Widespread in mid to high elevations (3,000-12,000 feet) in northern NV. Coniferous forest and sagebrush	All	All	All
Yuma myotis[1] *(Myotis yumanensis)*	Mid to low elevations (1,500-8,000 feet), coniferous forest, sagebrush and riparian habitats	All	All	All
Preble's shrew[1] *(Sorex preblei)*	Willow riparian			

Common Name	Habitat	Hydrographic Basin	PVA	KGRA
Northern goshawk[2] *(Accipiter gentilis)*	Mountain forests and riparian woodlands	1, 2, 4, 5, 8, 10	All	Rye Patch, Dixie Valley, New York Canyon, McGee Mountain
Western burrowing owl[2] *(Athene cunicularia hypugea)*	Open, treeless, sagebrush shrub	All	All	All
Sage grouse[1] *(Centrocerus urophasianus)*	Sagebrush shrub	All	All	All
Black tern[1] *(Chlidonias niger)*	Marshlands	1, 2, 4, 8, 10	All except 4, 8, 10, 12,	McGee Mountain, Rye Patch, Dixie Valley
Least bittern[3] *(Ixobrychus exilis hesperis)*	Dense emergent vegetation of larger marshlands	Unknown	Unknown	Unknown
White-faced ibis[3] *(Plegadis chihi)*	Marshlands	All	All	All, except San Emidio
Alvord chub[4] *(Gila alvordensis)*	Springs and small streams	1	1	
Sheldon tui chub[5] *(Gila bicolor eurysoma)*	Small, spring-fed streams	1	1	McGee Mountain
Pleasant Valley tui chub[1] *(Gila bicolor ssp.)*	Cold springs	4, 10	11, 13	
Lahontan creek tui chub[6] *(Gila bicolor robustus)**	Springs, streams, and rivers	2, 4	2, 6, 7, 9	Gerlach, Rye Patch, Dixie Valley
Columbia spotted frog[1] *(Rana lutevientris)**	Springs, margins of streams and rivers	1, 2	1, 2	McGee Mountain

Common Name	Habitat	Hydrographic Basin	PVA	KGRA
California floater[1] *(Anodonta californiensis)*	Valley floor, perennial streams, small substrates, high quality water	2, 4	2, 6, 7, 9	Rye Patch
Rice's blue butterfly[1] *(Euphilotes pallescens ricei)*	Dry desert flats and dune edges	7	None	None
Nevada viceroy[1] *(Limenitus archippus lahontani)*	Moist, open or shrubby areas, willow thickets, wet meadows	4, 8	8	Brady
Denio sandy skipper[1] *(Polites sabuleti sinemaculata)*	Alkali grasslands, moist meadows, salt marshes, alpine fell-fields, sagebrush flats	1	1	McGee Mountain
Springsnails[7]				
Pyrgulopsis augustae	Springs	4	13	Dixie Valley
Pyrgulopsis aurata	Springs	4	11	
Pyrgulopsis dixensis	Thermal springs	10	13	Dixie Valley
Pyrgulopsis gibba	Springs	1, 2, 3, 4, 10	1, 2, 6, 7, 10, 11, 13	Gerlach
Pyrgulopsis imperalis	Springs	2	2	
Pyrgulopsis limaria	Thermal springs	2		
Pyrgulopsis longiglans	Springs	2, 5	4, 8	Gerlach
Pyrgulopsis militaris	Thermal springs	2		
Pyrgulopsis notidicola	Thermal springs	2		
Pyrgulopsis pictilis	Springs	4	13	Dixie Valley
Pyrgulopsis sadai	Cold and thermal springs	10	13	
Pyrgulopsis umbilicata	Thermal springs	2		
*Pyrgulopsis bruesi**	Thermal springs	2		Gerlach

Common Name	Habitat	Hydrographic Basin	PVA	KGRA
Plants				
Weak milkvetch[1] *(Astragalus solitarius)*	Clay soils and low gullied hills, 4,600 – 5,210 feet	2	5	
Tiehm's milkvetch[1] *(Astragalus tiehmii)*	Volcanic ash and clay soils on gentle slopes, 5,280 – 5,750 feet	2		
Osgood Mountains milkvetch[1] *(Astragalus yoder-williamsii)*	Dry, open, decomposed granite soils, 5,660 – 7,300 feet	4	7	
Schoolcraft's cryptantha *(Cryptantha schoolcraftii)*	Volcanic ash and clay soils on gentle slopes, 4,880 – 5,760 feet	1, 2		
Goodrich biscuitroot[1] *(Cymopterus goodrichii)*	Alpine, moderate to steep talus slopes, 7,300 – 11,100 feet	4	9	Rye Patch
Windloving buckwheat[1] *(Eriogonum anemophilum)*	Exposed ridges and slopes, limestone and volcanic outcrops, 4,750 – 9,830 feet	2, 4, 6, 8	2, 7, 9. 11, 13	Rye Patch, Brady
Crosby's buckwheat[1] *(Eriogonum crosbyae)*	Volcanic ash and clay soils on gentle slopes, 4,600 – 7,000 feet	1, 2		Gerlach
Grimy ivesia[1] *(Ivesia rhypara var. rhypara)*	Dry, barren slopes, 5,370 – 6,200 feet	1, 2	1, 2, 3	
Bruneau River prickly phlox[1] *(Leptodactylon glabrium)*	Crevices in steep, crumbling volcanic cliffs, 4,710 – 5,300 feet	4	6, 9	Rye Patch
Smooth stickleaf[1] *(Mentzelia mollis)*	Dry, open, clay badlands 4,360 – 5,250 feet	2	3	
Nevada orcytes[1] *(Orcytes nevadensis)*	Deep, loose, sandy soils, 3,900 – 5,900 feet	2, 4, 5, 8	4, 5, 7, 8, 9	Rye Patch, Brady
Nevada dune beardtongue[1] *(Penstemon arenarius)*	Deep, loose, sandy soils, 3,920 – 5,960 feet	5, 8	8	Brady

Common Name	Habitat	Hydrographic Basin	PVA	KGRA
Cordelia beardtongue[1] *(Penstemon floribundus)*	Dry, open, volcanic talus, 4,240 – 7,400 feet	2	2, 3	
Obscure scorpion plant[1] *(Phacelia inconspicua)*	Loose, organic soils, 5,000 – 8,280 feet	4	9	Rye Patch
Soldier Meadow cinquefoil[1] *(Potentilla basaltica)*	Moist, alkaline soils, 4,380 – 4,580 feet	2	None	None

* Denotes rare species that are also known from the assessment area but not listed on the USFWS list
[1] Nevada Heritage Program Database
[2] Herron, et al. 1985
[3] Riser 1985
[4] Williams and Bond 1983
[5] Williams and Bond 1981
[6] Deacon and Williams 1981
[7] Hershler 1998

3.10.2 Environmental Impacts

Geothermal development could affect endangered, threatened, proposed, candidate, and species of concern in a variety of indirect ways. Potential impacts are summarized below, but a more thorough analysis of how each species would be affected would be conducted when site-specific EAs are prepared for development of each lease.

Environmental impacts of geothermal resource development are similar to other activities that affect terrestrial and aquatic species and habitats. While each species would respond differently to various impacts, all species could be affected by activities that alter thermal, physical, or chemical characteristics of aquatic and terrestrial habitats. Physical habitat alteration could include on-site facility construction, road and power line construction, and impacts of groundwater removal that could affect spring and stream discharge (which could modify physical, chemical, and thermal characteristics of aquatic habitats), and alter the thermal characteristics of soils. Surface discharge of thermal waters could also affect chemical and thermal characteristics of habitats that are important to terrestrial and aquatic communities.

Avian species could be most affected by direct and indirect influences of power line construction, operation, and maintenance, which include constructing roads, building towers, and stringing high-tension power lines. Habitat alteration and fragmentation, and modification of thermal and chemical characteristics of surface waters could affect vegetation used for nesting and foraging. Mortality could increase from electrocution when power lines are used for roosting. Indirect effects are largely attributed to increase human activity, which could displace individuals or reduce nesting success of species that are sensitive to disturbance. Road construction could also increase human access into areas that are currently remote, which could result in additional non-native species introductions, affect species sensitive to disturbance, or increase legal and illegal take.

Plant species could be most affected by habitat alteration during powerhouse facility, road, and power line construction, and inadvertent surface release of water. Removal of geothermal resources could also cause changes in thermal characteristics of soils.

Species associated with larger aquatic habitats (e.g., stream, marshland, and riparian species) could be adversely affected by increased activity in riparian systems (e.g., road construction, disturbances that increase erosion, etc.) and by changes in water quality that could be associated with surface release of geothermal water or construction materials. Spring-dependent species could also be affected by these factors in addition to alterations in discharge and thermal characteristics that could occur with increased groundwater use. Recent studies have also revealed that springs are biodiversity 'hotspots' in desert regions (Myers and Resh, 1999), which suggests that activities that adversely affect these resources would impact a relatively large amount of species that occur within the assessment area. Springs are occupied by a large number of mollusks that are endemic to the assessment area and Nevada (Hershler, 1998). Many of these habitats have been altered by previous activities such as groundwater use and livestock management (Shepard, 1993; Sada and Vinyard, 2002). Site-specific EAs that would be prepared for development of individual leases would consider the cumulative impacts of current and potential activities on spring biota. Sada, et al. (2001) summarizes guidance to implement resource activities while protecting spring resources.

3.10.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," there are no significant environmental impacts concerning threatened, endangered, and special status species. Using an updated PEA and stipulations as the guideline for new leases would more adequately provide the level of protection required to ensure that these species are protected under current Federal and State statutes.

The following are the potential environmental impacts on threatened, endangered, and special status species when analyzing the "reasonably foreseeable development scenario."

Exploration. The environmental impacts on threatened, endangered, and special status species are expected to be restricted to small geographical areas during the geothermal energy exploration phase. Unless special precautions are made, displacement of threatened, endangered, and special status species could cause long-term changes to habitat quality or their distribution and abundance, particularly species with restricted distribution and specific habitat requirements. In most cases, exploration would not be allowed in areas where these activities could have a negative impact on threatened, endangered, and special status species.

Development. Impacts of the development phase on threatened, endangered, and special status species would be very similar to the exploration phase although it would be expected to last somewhat longer and create more disruption. In most cases, development would not be allowed in areas where these activities could have a negative impact on threatened, endangered, and special status species.

Production. During the production phase, long-term impacts could occur to threatened, endangered, and special status species depending on where the permanent facilities are located and electrical power transmission lines are built. With production lasting up to several decades, these impacts would be long lasting; however they could be restricted to small geographical areas. The most significant impacts to threatened, endangered, and special status species include disturbance of soils and vegetation communities that could be difficult to rehabilitate, and alteration of groundwater resources that could alter spring and stream discharge.

Close-Out. Close-out of a developed geothermal production operation could cause short-term changes to threatened, endangered, and special status species due to increased dismantling activity and noise. Once the commercial activity has been closed-out and returned to its original, natural configuration, under proper management processes, any threatened, endangered, and special status species impacted by close-out are expected to return to normal activities.

3.10.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.11 WILD HORSES AND BURROS

3.11.1 Affected Environment

Wild horses and burros occur throughout the assessment area in a number of Herd Management Areas (HMA), where horses and burros are maintained and managed, and Herd Areas (HA) where they are neither maintained nor managed. Most HAs occur within checkerboard lands where the complex mixture of public and private lands prevents herd management. Table 3.11-1 lists these areas and geothermal assessment areas that are most closely associated with each HMA and HA. There are approximately 5,200 wild horses and 460 burros managed within the HMAs and HAs within the assessment area.

3.11.2 Environmental Impacts

Wild horses and burros could be affected by geothermal resource development within each PVA or KGRA; however, any effects would vary with each site, and would be assessed in site-specific EAs prepared for development of individual leases. Geothermal development could affect wild horses and burros by reducing water availability (i.e., decreasing spring discharge), polluting surface waters, modifying herd movement patterns, and disturbing animals by constructing, operating, and maintaining fences, power lines, and roads. These effects (particularly with water supplies) could have an undesired impact on wild horses and burros because, unlike livestock, they cannot be removed from the range and provided water.

Table 3.11-1 lists wild horse and burro HMAs within the assessment area, hydrographic basins where they occur, and proximate PVAs/KGRAs.

TABLE 3.11-1
HERD MANAGEMENT AREAS

Management Area	Hydrographic Basin	PVA/KGRA
Antelope Range*	4, 5	8
Augusta Mountains	4, 10	13, Dixie Valley
Black Rock Range East	2	3
Black Rock Range West	2	None
Blue Wing Mountains	5	8
Buffalo Hills	2	None
Calico Mountains	2	Gerlach
East Range*	10	10, 12
Fox Lake Range	2, 5, 6	8, San Emidio
Granite Range	2	Gerlach

Management Area	Hydrographic Basin	PVA/KGRA
Humboldt*	4, 8	9, Lovelock, Imlay
Jackson Mountains	2	4
Kamma Mountains	4	None
Lava Beds	2, 5	8
Little Owyhee	2, 4	5, 6
McGee Mountain	1	1, McGee Mountain
Nightingale Mountains	5, 6	8, Brady
North Stillwater	10	13, Dixie Valley
Selenite Range*	2, 5,	8, Gerlach
Seven Troughs	5	8
Shawave Mountains	5, 6	8, Brady
Snowstorm Mountains	4	6
Sonoma Range*	4	7 (S, E), 11
Tobin Range	4, 10	13, Dixie Valley
Trinity Range*	4, 5	8, 9, Lovelock
Warm Springs Canyon	2	None

* Denotes Herd Areas

3.11.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," there are no problematic environmental impacts concerning wild horses and burros under the Proposed Action. Using an updated PEA as the guideline for new leases would more adequately provide the level of protection required to ensure that these biological resources are protected under current Federal and State statutes.

The following are the potential environmental impacts on wild horses and burros when analyzing the "reasonably foreseeable development scenario."

Exploration. The environmental impacts on wild horses and burros are expected to be short-lived and restricted to small geographical areas during the geothermal energy exploration phase. Displacement of wild horses and burros is not expected to make significant long-term changes to habitat or animal life styles. The greatest short-term impacts would occur during mating and foaling periods and during road and fence construction. Watering sources could be affected by drilling residue and/or by excessive groundwater extraction (i.e., decreasing discharge from springs used as water sources).

Development. The development phase would be very similar to the exploration phase though it would be expected to last somewhat longer and create more disruption to wild horse and/or burro movement, and water resources.

Production. During the production phase, long-term impacts could occur to wild horses and burros depending on where the permanent facilities and electrical power transmission lines are built. With production lasting up to several decades, these impacts would be long lasting; however they would be restricted to small geographical areas. It is expected that wild horses and burros would quickly adjust to the commercial development and be able to cohabitate with minimum disruption.

Close-Out. Close-out of a developed geothermal production operation could cause short-term changes to wild horse and burro activity due to increased dismantling activity and noise. Once the commercial activity has been closed-out and returned to its original, natural configuration, wild horse and burro rehabilitation is expected to occur over a comparatively short period of time. This would depend on the speed of regrowth of cover and forage.

3.11.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.12 GEOLOGY AND MINERALS

3.12.1 Affected Environment

In Nevada, geothermal resources are classified for regulation and management as a mineral; therefore, issues relating to the geothermal resource are discussed in this section with mineral resources. Separate descriptions of the surficial geology, mineral resources, and geothermal resources of the WFO assessment area are presented below. The assessment of potential impact to geothermal and mineral resources resulting from additional geothermal resource development are combined.

3.12.1.1 Geology

The WFO assessment area is located in the northwest corner of the Great Basin portion of the Basin and Range physiographic province of the western United States. The Great Basin is characterized by north trending mountain ranges and intervening valleys. The pattern of mountains and valleys results from the structural history of the region where movement along faults have raised mountains in which bedrock is exposed and created basins which have filled with sediments eroded from the mountains.

The following general description of the geology exposed in mountain blocks in the assessment area is taken from the Geologic Map of Nevada (Stewart and Carlson, 1977). Information is organized around the eight hydrographic regions, which are represented in the assessment area.

Northwest Region. Volcanic rocks representing a variety of ages are exposed in the mountains in northwest Humboldt County. These mountains also present a significant exposure of intrusive rocks, especially around Continental Lake and Virgin Valleys.

Black Rock Desert Region. Mountain blocks bounding basins in central Humboldt, northwestern Pershing, and central Washoe Counties are composed principally of volcanic rock. The southern end of the Black Rock Desert Basin is marked by intrusive rock exposures on both the northern and southern sides. Mountains along the boundary between the Black Rock Desert and West Central Regions expose consolidated sedimentary rocks and their metamorphic equivalents and intrusive rocks.

Humboldt River Region. In the mountain blocks, various crystalline or consolidated sedimentary rocks are exposed. The northeastern boundary of the region in Humboldt County consists of volcanic rocks. Bedrock exposed in the eastern portion of the Humboldt River Basin includes volcanic rocks predominately and some carbonate rock. A mixture of sedimentary, volcanic, and intrusive rock bound the west side of the Humboldt River Basin in Humboldt County and both sides of the basin through the Imlay and Lovelock Valley portions of the region. Volcanic rocks dominate the bounding mountain ranges in the southern portion of Lovelock Valley and below.

West Central Region. Basins in the western part of the region are bounded by mountain ranges, which expose intrusive rocks. The eastern boundary of the region, adjacent to the Humboldt River Basin, is composed of sedimentary, metamorphic, and volcanic rocks with a scattering of intrusive outcrops.

Truckee River Region. Winnemucca Lake Valley is bounded on the west side by mountains composed of volcanic rocks and on the east side by intrusive rocks in the north and volcanic rocks in the south.

Carson Desert Region. A small piece of the Carson Desert Region, Packard Valley, extends into south central Pershing County. This basin is bounded by mountains composed primarily of sedimentary and metamorphic rocks with some exposure of volcanic rock along the west side.

Central Region. The Central Hydrographic Region in southeast Pershing County is bounded by mountain ranges containing a wide variety of rock types. These include exposures of consolidated sedimentary rocks, metamorphic rocks, volcanic rocks, and a scattering of intrusive rocks.

The lithology and structural features of the mountain blocks surrounding and throughout the assessment area are critical in the occurrence of water and mineral resources. Most of the bedrock formations lack permeability except where fault zones or fractures have been created by deformation. Thus, where there are no, or few fractures or faults, precipitation tends to run off to the adjacent valleys. Where fractures and faults are present, a portion of the precipitation may infiltrate into deep circulation patterns, which may be sufficiently deep to generate a geothermal resource.

In general, it is the bedrock formations of the region that host various metal deposits of economic value. In contrast, many of the industrial mineral deposits occur in the sediments filling valleys between mountain ranges.

3.12.1.2 Mineral Resources

Economic minerals of the region fall into the two broad categories: metals and industrial minerals. Table 3.12-1 identifies those hydraulic basins in the assessment area in which mineral resources occur. The metals deposits tend to occur in the bedrock formations of the mountain blocks while industrial minerals are commonly found in the valley fill sediments.

Important quantities of quicksilver, tungsten, gold, and iron (and lesser amounts of other commodities) have been produced from mines in Humboldt County. Mineral deposits have been found in almost all the rock units exposed in the county (Willden, 1964).

TABLE 3.12-1
GEOTHERMAL AND MINERAL RESOURCES BY HYDROGRAPHIC BASIN

Geothermal Resources					Mineral Resources	
Hydrographic Region	Leases		KGRA	PVA Number	Metals	Industrial Minerals
	Existing	Application				
Northwest Region (1)						
1. Pueblo Valley		X		1	X	
2. Continental Lake Valley	X	X		1	X	X
3. Gridley Lake Valley		X		1		
4. Virgin Valley						X
Black Desert Region (2)						
21. Smoke Creek Desert					X	X
22. San Emidio Desert	X	X	San Emidio	8	X	X
23. Granite Basin				8		
24. Hualapai Flat		X		8	X	
25. High Rock Lake Valley					X	X
26. Mud Meadow						
27. Summit Lake Valley						
28. Black Rock Desert	X	X	Gerlach	2,3,4,8	X	X
29. Pine Forest Valley				2	X	
30. Kings River Valley						X
31. Desert Valley		X		7	X	
32. Silver State Valley				7	X	
33. Quinn River Valley				5	X	

Geothermal Resources					Mineral Resources	
Hydrographic Region	**Leases**		**KGRA**	**PVA Number**	**Metals**	**Industrial Minerals**
	Existing	**Application**				
Humboldt River Basin (4)						
64. Clovers Area				7	X	
65. Pumpernickel Valley		X		7	X	
66. Kelly Creek Area				7	X	
67. Little Humboldt Valley		X		6		X
68. Hardscrabble Area		X		6		
69. Paradise Valley		X		6	X	
70. Winnemucca Segment		X		7	X	X
71. Grass Valley	X	X		11	X	
72. Imlay Area	X	X	Rye Patch	9	X	X
73. Lovelock Valley	X	X		8,9	X	X
74. White Plains	X	X	Brady	8	X	X
West Central Region (5)						
75. Brady Hot Spring Area	X	X	Brady	8	X	X
77. Fireball Valley	X			8	X	X
78. Granite Springs Valley				8	X	X
79. Kumiva Valley				8	X	
Truckee Basin (6)						
80. Winnemucca Lake Valley		X		8	X	X
Carson River Basin (8)						
101A. Packard Valley					X	X
Central Region (10)						

Geothermal Resources					Mineral Resources	
Hydrographic Region	Leases		KGRA	PVA Number	Metals	Industrial Minerals
	Existing	Application				
128. Dixie Valley	X		Dixie Valley	13	X	
129. Buena Vista Valley		X	New York Canyon	10,12	X	X
130. Pleasant Valley				13	X	
131. Buffalo Valley		X		13	X	X
132. Jersey Valley		X		13	X	X

Pershing County. There are 45 mining districts in Pershing County. Mines of Pershing County have extracted tungsten, antimony, iron, gypsum, diatomite, mercury, gold, silver, and copper (Johnson, 1977). Since 1914 the significance of gold and silver has been overshadowed by the importance of the other minerals. The extractable mineral resources occur on the flanks of mountain ranges throughout the county. However, many of the mining districts incorporate portions of the adjacent valleys.

Washoe County. The principal metal production in Washoe County has been based on gold, silver, lead, copper, and zinc. Minor amounts of mercury, uranium, tungsten, arsenic, and antimony have also been produced. A variety of other minerals are known to occur in the county but there has been no commercial development (Bonham, 1969). Industrial mineral production has included clay, diatomite, aggregate, and sand and gravel. Metallic minerals occur generally in the bedrock formations of mountain blocks. Uranium deposits occurring in unconsolidated sedimentary formations are the exception. Industrial minerals occur in consolidated and unconsolidated sedimentary formations.

Churchill County. Mineral deposits have generally been small in Churchill County. Production has been largely in gold and silver although nonmetallic minerals became increasingly important through the 1970s. In addition to gold and silver, there are small deposits of iron and other base metals. The metal deposits generally occur in Mesozoic and Tertiary rocks. However, these deposits are in mountain ranges outside the WFO assessment area. Industrial mineral production has included sand and gravel, diatomite, pumice and perlite, salt, stone, limestone, fluorspar, and gem stones (Willden and Speed, 1974).

3.12.1.3 Geothermal Resources

Garside and Schilling (1979) characterize the entire Basin and Range physiographic province as having high heat flow. They identify a region of unusually high average heat flow in north central Nevada centered on Battle Mountain. The delineated region extends into southeastern Humboldt County, eastern Pershing County, and northeastern Churchill County. However, Garside and Schilling (1979) note that the extent of the area that should be incorporated under the unusually high average heat flow designation is not determined.

The distribution of thermal springs, spring deposits, and other indicators indicate that thermal resources are not limited to the region of the "Battle Mountain high." Rather exploration targets are typically defined by high heat flow, abundant hot springs, late Tertiary and Quaternary volcanism, recent tectonic activity, and high subsurface temperature gradients (Johnson, 1977). Garside and Schilling (1979) also note that hot springs appear to occur most frequently along major faults, which bound basin-and-range mountain blocks. Table 3.12-1 identifies those hydrographic basins in which geothermal resources exist.

Keller and others (1978) suggest that the structural extension that has occurred in the basin and range province has resulted in a thinning of the earth's crust permitting the high average heat flow. Garside and Schilling, (1979) suggest a mechanism that allows this heat to be transferred to groundwater and Welch and Preissler (1990) refine the mechanism into a conceptual model of geothermal fluid flow. Summarizing the Welch and Preissler (1990) conceptual model: A portion of the precipitation that falls on the mountains infiltrates the mountain through fractures and faults. This water migrates to depth and for time sufficient for heating of the water, which then rises through fractures or faults to discharge as hot springs. Thus, the geothermal systems function in a manner very similar to groundwater systems having the same water source and following similar paths to the valley. Geothermal and groundwater reservoirs are interconnected by virtue of the source water supply, the geologic media through which water flows, and flow system proximity. Groundwater resources are discussed in more detail in section 3.3.1.3.

Shevenell and others (2000) map warm and hot wells and springs and industrial applications of geothermal resources. They indicate warm or hot wells or springs in virtually every hydrographic basin in the assessment area. Geothermal power generation facilities are located in or are adjacent to the WFO assessment area at San Emidio Desert Valley, Brady Hot Springs, and Dixie Valley. Direct use of geothermal energy is identified in the San Emidio Desert Valley and Brady Hot Springs Valley for vegetable dehydration. Garside and Schilling (1979) summarized site-specific conditions for many of the geothermal features in the assessment area. The following review of geothermal features in the WFO assessment area relies on Shevenell and others (2000) and Garside and Schilling (1979).

Northwest Region. Shevenell and others (2000) identify warm and hot springs and wells in Continental Lake, Gridley Lake, and Virgin Valleys. Garside and Schilling (1979) describe two areas of geothermal features in the Northwest Region. Baltazor (sometimes called Continental) Hot Springs, on the eastside-bounding fault of the Pueblo Mountains, and Bog Hot Spring are located in Continental Lake Valley Hydrographic Basin. Water temperature at Baltazor Hot Springs is about 200^{o}F from a reservoir estimated to be 306^{o}F to 329^{o}F. Bog Hot Spring discharges about 1,000 gallons per minute (gpm) at about 131^{o}F; the reservoir temperature is estimated to be near 227^{o}F. These springs lie along a lineament that extends from Soldier Meadow northeastward into Oregon and may be related to the thermal area around McGee Mountain. The springs are associated with PVA 1 and lease applications and existing leases in Continental Lake Valley.

Black Rock Desert Region. Warm and hot springs, and wells are located in every hydrographic basin in the Black Rock Desert region (Shevenell, 2000).

Three PVAs in the northern end of the Black Rock Desert Hydrographic Region are each associated with some indication of thermal conditions. A mine and two wells give indication of unusual temperature conditions in the Quinn River Valley. High temperatures have been reported in the underground Cordero Mercury Mine. A well immediately down slope of the mine produces water at about 140^{o}F from a depth of 400-600 feet and a second well, 5.5 miles to the north, reports elevated temperatures. These thermal conditions are associated with PVA 5.

Howard Hot Spring and Dyke Hot Spring in Pine Forest Valley are included in PVA 2. Howard Hot Spring is reported to discharge at about 118^{o}F from a reservoir estimated to be about 262^{o}F (Garside and Schilling, 1979). Dyke Hot Spring, at the southern end of the east side bounding fault of the Pine Forest Range, is reported somewhat warmer, discharging water at about 158^{o}F from a reservoir temperature of 262^{o}F to 279^{o}F (Garside and Schilling, 1979).

PVA 3 and several lease applications are associated with Pinto Hot Springs in the northwest corner of the Black Rock Desert Hydrographic Basin. These springs are reported to discharge at about 200°F from a reservoir estimated to have a temperature in the range of 324°F to 329°F.

Macfarlane's Bath House Spring is located on the east side of the Black Rock Desert Basin (Garside and Schilling, 1979) in association with an outcrop of Tertiary volcanic and sedimentary rocks (Willden, 1964). The spring and Tertiary rock outcrop may lay on a southwesterly extension fault, which Willden (1964) describes as bounding the northwest face of the Jackson Mountains on the east side of the Black Rock Desert Basin. This spring is associated with PVA 4.

The greatest concentrations of thermal activity in the region are at the south end of the Black Rock Desert Basin in Hualapai Flat and near the extreme south end of Black Rock Desert. These features include Wards Hot Springs and Granite Range thermal waters in Hualapai Flat. Wards Hot Springs, located along north-northeast trending normal faults, discharge at temperatures up to 220°F from a reservoir estimated to be about 258°F (Garside and Schilling, 1979). No surface expression is present in the Granite Ranch area in Hualapai Flat but thermal waters have been identified in wells.

Geothermal features at the south end of the Black Rock Desert where the Smoke Creek Desert and San Emidio Desert meet are found in the Trego and Gerlach. Springs in the Trego area discharge at about 187°F from a reservoir estimated to be between 248°F and 262°F. The Gerlach springs discharge water at about 208°F from a reservoir estimated to be between 333°F and 347°F. These springs appear to lie along a northeast trending fault that may intersect the fault alignment that controls thermal springs in the Mud Meadow area (Garside and Schilling, 1979). The geothermal features of this area are associated with PVA 8, and lease applications in Hualapai Flat and the Gerlach KGRA.

Subsurface water at the south end of San Emidio Desert has been measured at 128°F. This area is within PVA 8 and in the vicinity of the San Emidio KGRA. Numerous existing leases and lease applications are associated with this KGRA. The resource has been developed for power production. A 4-megawatt binary power plant and vegetable dehydration plant are located within this KGRA.

Humboldt River Region. In the Humboldt River Region, thermal features are present in several tributary valleys and within the Humboldt River Valley. Hot springs at the Tipton Ranch in Pumpernickel Valley discharge at up to 185°F from a reservoir estimated to have temperatures in the range of 381°F to 385°F (Garside and Schilling, 1979). These springs are associated with a northeast trending fault that bounds the Sonoma Range on the west side of the valley. Pumpernickel Valley is within PVA 7. There are lease applications in the east central and south areas of the valley.

Leach Hot Springs are in Grass Valley, which is also tributary to the Humboldt River. These springs on the west side of the Sonoma Range discharge at temperatures of up to 204°F from a reservoir estimated to be between 311°F and 349°F (Garside and Schilling, 1979). These springs appear to be associated with PVA 11 at the south end of Grass Valley. PVA 11 contains both existing leases and lease applications.

Geothermal features are scattered along the main stem of the Humboldt River throughout the WFO assessment area. Twelve springs, which discharge at temperatures from 109^{o}F to 165^{o}F, are noted in the Golconda area. The supporting reservoir is estimated to have a temperature of about 239^{o}F (Garside and Schilling, 1979). Warm springs discharge along a lineament that is an extension of the range-bounding fault on the west side of the East Range. Water from these springs has temperatures of 82^{o}F to 84^{o}F. Faults in this area are marked by spring deposits (Garside and Schilling, 1979). These thermal features in PVA 7 along the Humboldt River on the east side of the assessment area. The warm springs at the north end of the East Range are associated with lease applications.

The central reach of the Humboldt River within the assessment area is designated as PVA 9. Thermal features within this area include spring deposits in the Humboldt/Rye Patch area (south of Imlay) and hot wells in the Colado area. Though no springs are known in the Humboldt/Rye Patch area, two areas of low mounds formed by hot spring deposits have been identified approximately one mile west of a major fault which separates Mesozoic rocks and surficial deposits (Garside and Schilling, 1979). Water temperature for the Colado wells has been measured at 150^{o}F. These hot underground waters are thought to be associated with faults along the west side of the Humboldt Range (Garside and Schilling, 1979). Thermal features in the Humboldt area are associated with the Rye Patch KGRA, active leases, and lease applications. A 12.5-megawatt binary poser plant has been constructed and is almost ready to go on line in the Rye Patch KGRA. Existing leases and lease applications exist in the Colado area.

West Central Region. A scattering of warm or hot springs, or wells are indicated in the Kumiva and Granite Springs Valleys (Shevenell, 2000) but the principal thermal feature in the region is located around Brady Hot Springs. These springs are located northeast of Fernley on the boundary between the Humboldt River and West Central Hydrographic Regions. Thermal features of the Brady Hot Springs area have been recognized since before 1885. Commercial development was initiated in the late 1950s (Willden and Speed, 1974). Between 1959 and 1979, 20 major geothermal wells were drilled in the area. The waters were used for drinking by California emigrants, developed for bathing around 1929, and for food dehydration in the late 1970s (Garside and Schilling, 1979). The resource has also been developed for power production (Shevenell and others, 2000) and is currently producing 21 megawatts of electricity. A vegetable dehydration plant is still using this resource.

Presently there is no surface discharge of thermal waters at Brady Hot Springs. Former springs and the underground resource are oriented along the north-northeast trending Thermal Fault, which bounds the west side of the Hot Springs Range. The reservoir likely receives recharge by underflow from Fireball Valley to the northwest and the Fernley area to the south. All discharge at present occurs by pumping (Garside and Schilling, 1979).

Desert Peak is located a few miles east of Brady Hot Spring in the northern Hot Springs Range. The resource has been developed for power production and is currently producing 9.9 megawatts of electricity. The reservoir is estimated to have temperatures near 406°F (Garside and Schilling, 1979).

Brady Hot Springs and the Desert Peak area are both within PVA 8. Brady Hot Springs area has been designated a KGRA. Numerous lease applications exist in the Desert Peak area.

Truckee River Region. There are warm and hot wells located at the south end of Winnemucca Lake Valley and warm springs identified on the west side of the valley (Shevenell, 2000) in the southwest corner of the WFO assessment area, Pershing and Washoe Counties. Garside and Schilling (1979) do not have site-specific information on the character of these geothermal features. The valley lies within PVA 8 immediately south of the San Emidio KGRA. There are lease applications in the southern third of the valley.

Carson Desert Region. A number of warm wells are identified in the Packard Valley Basin (Shevenell, 2000) on the southern boundary of the WFO assessment area, Pershing County. However, Garside and Schilling (1979) document no site-specific information on these geothermal features. Packard Valley lies southeast of PVA 9 and west of PVA 12, which includes the New York Canyon KGRA. There are no identified lease applications in Packard Valley.

Central Region. Five valleys of the Central hydrographic region lie within the WFO assessment area. These include: Buena Vista, Buffalo, Dixie, Pleasant, and Jersey Valleys. All five valleys contain geothermal features. No site-specific information on the nature of geothermal features in Pleasant Valley is available in Garside and Schilling (1979).

In Buena Vista Valley, Kyle Hot Springs discharge water at between 159°F and 204°F from a reservoir estimated to have a temperature in the range of 340°F to 381°F (Garside and Schilling, 1979). These springs are located approximately one mile west of the mountain front fault on the western side of the East Range and are associated with several intersecting fault sets. The area surrounding Kyle Hot Springs has been designated PVA 10 and includes a lease application.

The New York Canyon kaolin deposit in southern Buena Vista Valley is a hot spring type deposit, which occurs near a mountain front fault. A development drill hole drilled in 1963 produced steam from a depth of 140 feet (Garside and Schilling, 1979). This area is associated with the New York Canyon KGRA in PVA 12.

Buffalo Valley Hot Springs are reported to have temperatures of up to 174°F derived from a reservoir estimated to be 257°F. These springs are associated with a recognized fault along the western side of the Fish Creek Mountains (Garside and Schilling, 1979) east of the WFO assessment area in Lander County.

Thermal springs discharge at temperatures of 84°F to 135°F in Jersey Valley. These springs are thought to be supported by a reservoir with temperatures between 288°F and 360°F. The springs lie along a possible projection of a mountain front fault (Garside and Schilling, 1979).

The predominant thermal springs of northern Dixie Valley are the Sou Hot Springs and the Lower Ranch Hot Spring. Sou Hot Springs discharge at 163°F to 185°F from a reservoir estimated to be about 212°F to 237°F. Lower Ranch Hot Spring has a discharge temperature of 104° from an estimated reservoir temperature of 201°F to 212°F.

PVA 13 encompasses northern Dixie Valley, Jersey Valley, and most of Buffalo Valley. There are lease applications in Buffalo Valley; these are across the valley from Buffalo Hot Springs. Lease applications in Jersey Valley are associated with the hot springs present there. The entire northern portion of Dixie Valley within the WFO assessment area is in the Dixie Valley KGRA. A power plant producing 66 megawatts of electricity has been developed in Dixie Valley.

3.12.1.4 Oil and Gas Resources

Central Region. In 1993 a gold exploration-drilling project struck oil-laden geothermal water (175°F) at Kyle Hot Springs in Buena Vista Valley (PVA 10). The area was leased and drilled for oil and gas resources. There has been no known oil or gas production from the property; however, exploration has continued to the present. It is thought that the oil is Tertiary in age and lacustrine in origin.

3.12.2 Environmental Impacts

3.12.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," impacts to geology, mineral, and geothermal resources, expected from leasing would be minimal. Updated stipulations and mitigation measures would be developed, after additional NEPA analysis has been completed, for each lease application.

The following are the potential environmental impacts on geology and minerals when analyzing the "reasonably foreseeable development scenario."

Exploration. The impacts to mineral and geothermal resources would be very minor or non-existent during the exploration and testing phase, where it is anticipated that a minimal amount of fluid would be withdrawn from the reservoir. This means that initial activities related to surface exploration and even test drilling and evaluation could proceed without adverse impacts to mineral resources. Any impacts to mineral resources should occur only when production of geothermal fluids begins. This is the last stage of the process and there would be considerable data available to assess possible impacts to mineral resources.

The mineral resources in the assessment area can be divided into two general categories: 1) static and 2) dynamic. The static or immobile resources are generally valuable metals, industrial minerals, etc., which are securely bonded in the rocks. An example is a gold/silver deposit in volcanic rocks. It is anticipated that the development of a geothermal resource near this type of deposit would have virtually no impact on this resource unless there were associated thermal fluids, and that these thermal fluids had some value or importance in maintaining or extracting the mineral resource. A more probable impact would be to the groundwater resource in the mining area, which would be covered in another section.

Development and Production. The major impacts resulting from the development and production of new geothermal resources would be to dynamic mineral resources (thermal springs and existing geothermal production facilities). Thermal springs or areas where thermal waters seep to the surface have been impacted in areas with current geothermal production where spring flow has been reduced or dried up completely. This is a result of geothermal well operation reducing reservoir pressures, which impacts thermal spring discharge. Potential exists for this environmental impact even when there is a 100 percent injection of spent geothermal fluids. These springs generally discharge under a low hydraulic head and therefore are easily impacted by slight reductions in reservoir pressures.

This reduction, or loss, of thermal spring flow would result in a second tier of environmental impacts, which would be felt in the biological community, which in turn relies on the impacted spring. These secondary impacts would be delineated in other sections of this report.

It is assumed that 100 percent of all thermal fluids produced from wells would be injected; however, the location of production and injections wells could be such that some land subsidence could occur. Land subsidence could also have other environmental impacts in a localized area.

Existing geothermal facilities could certainly be adversely impacted by the development of new geothermal wells in an area. In many situations it is unclear whether this is an environmental or economic impact. Any new geothermal production facility could certainly reduce both reservoir temperature and pressure at the wells supplying fluids to existing geothermal plants. This could possibly result in some environmental impacts but would most likely impact the economic viability of the existing plants.

Summary. The following environmental effects could be anticipated:

- Exploration and testing would have no, or negligible, environmental impact on mineral or geothermal resources.

- Production of geothermal fluids in any hydrographic basin has the possibility of impacting thermal springs in the basin. Detailed hydrologic data, provided in site-specific EAs, would be required to make a firm determination.

- If exploration, development, or production occurs in PVA 10, there is a high likelihood of encountering oil-laden geothermal fluids, which could cause impacts to the oil reservoir.

- Localized land subsidence could occur even with 100 percent inject of spent geothermal fluids.

- Impacts on existing geothermal production facilities would be primarily economic but the combined impact of old and new production facilities could have an enhanced impact on thermal springs in a basin.

3.12.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.13 NATIONAL CONSERVATION AREA, WILDERNESS, AND WILDERNESS STUDY AREAS

3.13.1 Affected Environment

The assessment area consists of PVAs, KGRAs, and pending lease applications on public lands managed by the WFO and lands in the Dixie Valley KGRA (managed by the CCFO). The area also encompasses four Nevada counties: Humboldt, Pershing, Washoe, and Churchill Counties. Geothermal leasing has been withdrawn from NCAs, wilderness, and WSAs.

3.13.1.1 Management Prescriptions

Nation Conservation Areas (NCAs). NCAs are designated by Congress to preserve and protect historical and environmentally sensitive areas. There are no NCAs within the assessment areas; the nearest NCA is the Black Rock Desert-High Rock Canyon Emigrant Trails NCA. The Black Rock Desert Act was signed into law on December 21, 2000 and amended November 2, 2001. BLM manages the NCA. PVA 8 borders this NCA. The NCA is located in Hydrologic Basins 1 and 2, and outside of the assessment area.

Wilderness. There are no wilderness areas within the geothermal assessment area. Congress passed the Wilderness Act in 1964.[17] The Wilderness Act established the National Wilderness Preservation System that includes all wilderness-designated lands. Wilderness is defined as "…an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Furthermore, wilderness is distinguished as "…an area of undeveloped Federal land retaining its primeval habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." PVAs 3 and 4 border wilderness. Wilderness is found in Hydrologic Region 2.

Wilderness Study Areas (WSAs). WSA is a designation given to lands under investigation to determine if the lands are suitable as wilderness areas. The BLM manages WSAs. PVAs 1, 8, 13, and the Dixie Valley KGRA border or encompass parts of WSAs. All the hydrologic basins contain WSAs except Basin 6.

3.13.1.2 National Conservation Area

On December 21, 2000, the President signed Public Law 106-554 establishing the Black Rock Desert–High Rock Canyon Emigrant Trails NCA. This act set aside approximately 1.2 million

[17] Wilderness Act of 1964 (P.L. 88-577 (16 USC §§1131-1133))

acres of land in northwestern Nevada. The Black Rock Desert-High Rock Canyon Emigrant Trails NCA consists of the Black Rock Desert (315,700 acres), High Rock Canyon Emigrant Trails NCA (815,000 acres), and additional wilderness areas in the vicinity (80,800 acres).

This NCA is one of the last significant sections of the historic California emigrant trails. The special aspects of the NCA are the reminders of the journey to the west coast in the early 1800s. Wagon ruts, inscriptions and an unchanged landscape since the time of the pioneers are a few of the special aspects. The area covered by the NCA stretches from Rye Patch Reservoir, north to the Black Rock Desert and Mud Meadows, west to Fly Canyon and High Rock Canyon and to around Vya, Nevada.

3.13.1.3 Wilderness

The wilderness in the assessment area is encompassed within the NCA. The 10 wilderness areas are as follows:

TABLE 1.13-1
WILDERNESS AREAS
(Designated on December 21, 2000)

Wilderness	Acres
Black Rock Desert Wilderness	315,700
North Jackson Mountains Wilderness	65,400
South Jackson Mountains Wilderness	52,800
Pahute Peak Wilderness	46,600
North Black Rock Range Wilderness	59,300
East Fork High Rock Canyon Wilderness	48,700
High Rock Lake Wilderness	30,800
Little High Rock Canyon Wilderness	24,000
High Rock Canyon Wilderness	57,400
Calico Mountains Wilderness	56,800

These 10 wilderness areas are depicted on Figure 3.13-2. These wilderness areas were protected by WSA designations for more than 20 years prior to wilderness designation. Grazing is still allowable, as the wilderness areas cover 22 allotments managed by the Winnemucca and Surprise BLM Field Offices. Motorized vehicles, and mechanical transport and equipment are not allowed in wilderness areas. The only motorized items allowed are wheelchairs. New mining claims or mineral leases would not be granted and Special Recreation Permits may be restricted.

Black Rock Desert Wilderness Area. The Black Rock Desert Wilderness Area is the largest wilderness area in Nevada. The wilderness stretches 40 miles from north to south and 20 miles from east to west. It is also unique to the National Wilderness Preservation System, a desert playa. A management plan is scheduled for release for public comment in late summer 2002.

North Jackson Mountains Wilderness Area. The North Jackson Mountains Wilderness Area is close to 7 miles long and wide. Jackson Creek Ranch Road runs along the western side north to south and provides access to the wilderness. North Jackson is separated from the South Jackson Mountains Wilderness Area by a road that follows Trout and Jackson Creeks. The North Jackson Mountains Wilderness Area has riparian areas including Mary Sloan, New Years, and Deer Creeks. A management plan is scheduled for release for public comment in late summer 2002.

South Jackson Mountains Wilderness Area. The South Jackson Mountains Wilderness Area is 15 miles long and between 2 and 11 miles wide. King Lear Peak is a 9,000-foot mountain peak located in the South Jackson Mountains Wilderness Area. The peak is known for rock climbing and is considered the best in northwestern Nevada. A cherry stemmed road leads to McGill Canyon and is used as a starting point for hikes. The area has cottonwood stands and running water, which makes it a popular recreation area. A management plan is scheduled for release for public comment in late summer 2002.

Pahute Peak Wilderness Area. The Pahute Peak Wilderness Area borders the Black Rock Desert Wilderness Area. The climb to the top of Pahute Peak (also called Big Mountain) provides a view of the Applegate-Lassen Historical Trail and all the other wilderness areas in the NCA. Stands of aspen and mountain mahogany create scenic views. A management plan is scheduled for release for public comment in late summer 2002.

North Black Rock Range Wilderness Area. The North Black Rock Range Wilderness Area is a refuge to many animals due to the presence of water at Coleman and Soldier Creeks. Deer, antelope, and valet quail are often found at the creeks. The headwaters are a frequent destination for hikers. A management plan is scheduled for release for public comment in late summer 2002.

East Fork High Rock Canyon Wilderness Area. The East Fork High Rock Canyon Wilderness Area's distinctive features are the variety of color and landforms, including bright greens, yellows, reds, browns, and orange; and high cliffs, steep slopes, and short rimrocks. The Lassen-Applegate Trail passes through this wilderness area as it makes its way into Oregon and California. A management plan is scheduled for release for public comment in late summer 2002.

High Rock Lake Wilderness Area. The High Rock Lake Wilderness Area is named for the lake found in the northwest corner of the wilderness. The Applegate-Lassen Trail passes through the northern part of the wilderness. A management plan is scheduled for release for public comment in late summer 2002.

FIGURE 3.13-1
BLACK ROCK DESERT–HIGH ROCK CANYON EMIGRANT TRAILS NCA
AND ASSOCIATED WILDERNESS AREAS

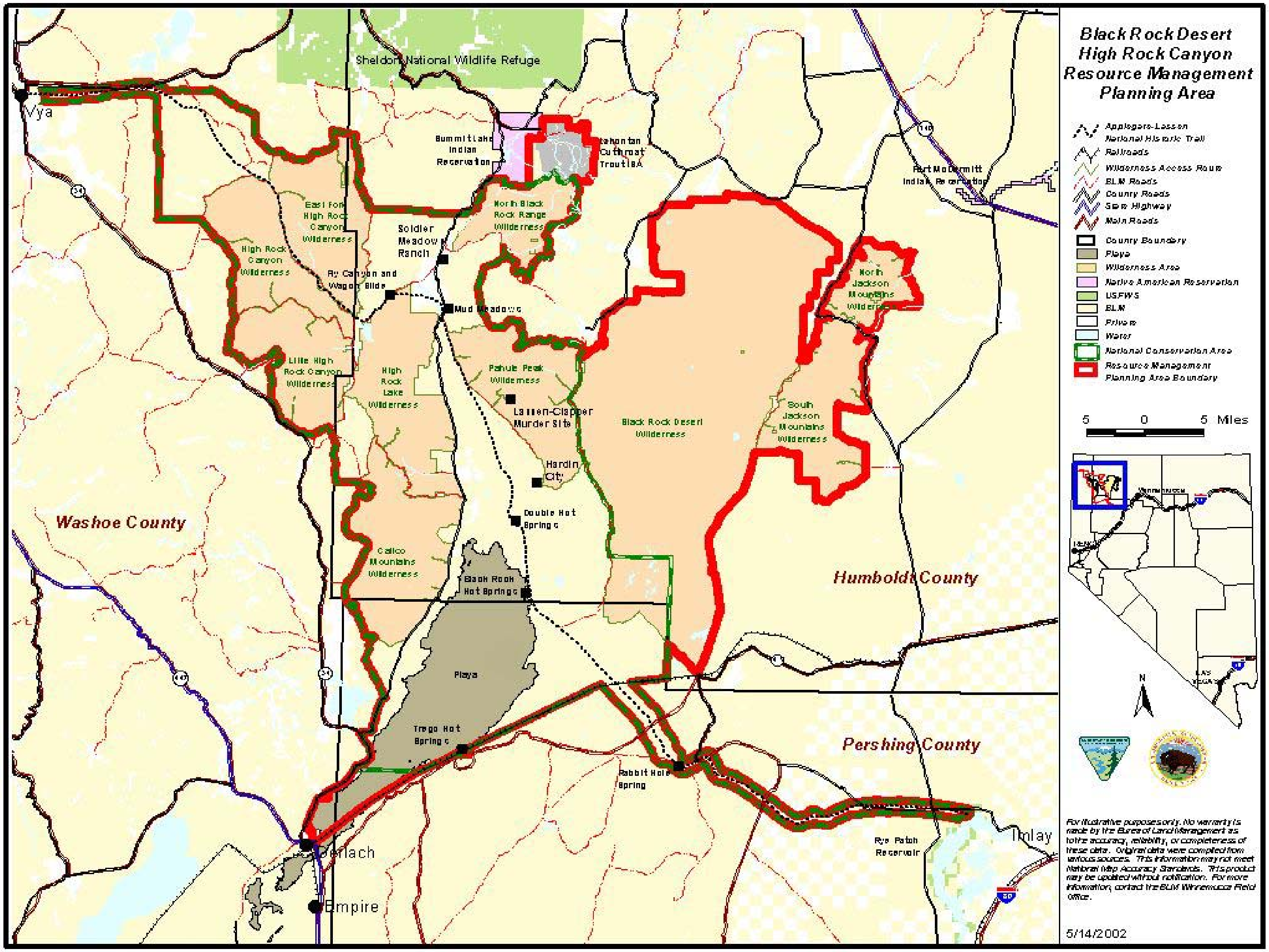
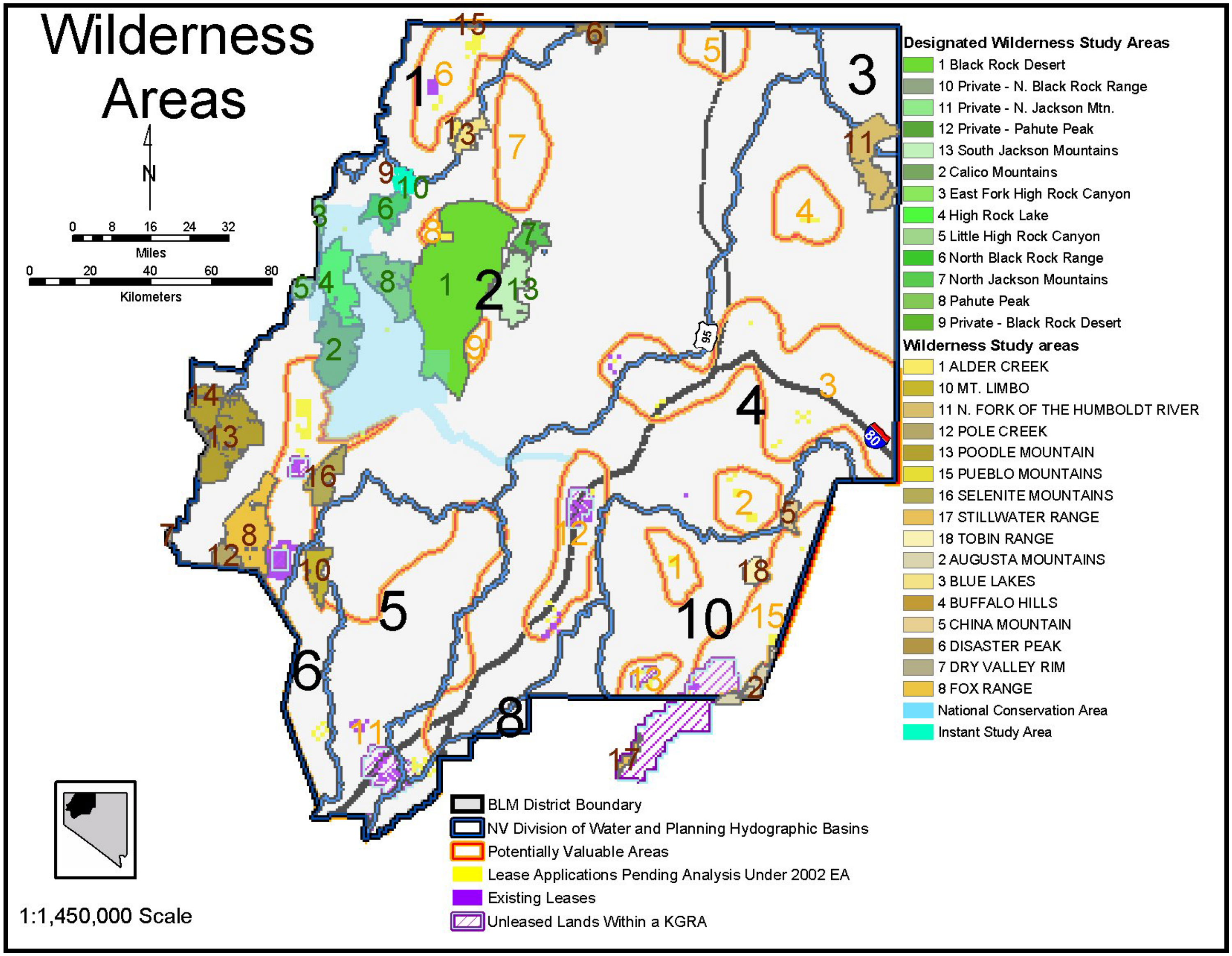


FIGURE 3.13-2
ASSESSMENT AREA WILDERNESS AREAS



Little High Rock Canyon Wilderness Area. The Little High Rock Canyon Wilderness Area is a meadow full of grasses and tules wetlands, named for the tule plant. The wetlands attract migrating birds and small mammals. A management plan is scheduled for release for public comment in late summer 2002.

High Rock Canyon Wilderness Area. The High Rock Canyon Wilderness Area contains Mahogany Creek—considered one of the best features in the surrounding wilderness. Wildlife includes nesting birds, birds of prey, endemic desert fish, and antelope. A management plan is scheduled for release for public comment in late summer 2002.

Calico Mountains Wilderness Area. The Calico Mountains Wilderness Area was named for the many colors the mountain range exhibits. The Calico Mountain Wilderness Area is 17 miles north to south and 7 miles east to west. Access to a portion of the wilderness is available via Soldier Meadows Road. Rock hounding and sightseeing are popular activities in this wilderness. A management plan is scheduled for release for public comment in late summer 2002.

3.13.1.4 Wilderness Study Areas

The WSAs are spread throughout the assessment area. There are seven WSAs that are either bordered or intersected by the assessment area.[18] The seven WSAs are as follows:

TABLE 3.13-2
WILDERNESS STUDY AREAS

Wilderness Study Areas	Acres	WSA Number
Fox Range	75,404	NV-020-014
Selenite Mountains	32,041	NV-020-200
Mount Limbo	23,702	NV-020-201
China Mountain	10,358	NV-020-406P
Tobin Range	13,107	NV-020-406Q
Pueblo Mountains	72,690	OR-2-81/NV-020-642
Augusta Mountain	89,372	NV-030-108

Fox Range WSA. The Fox Range WSA is 20 miles north to south and 2-9 miles east to west. There are three types of landforms represented in Fox Range WSA: steep canyons, smooth rolling hills, and desert piedmont. Riparian vegetation, barren ridges, and sand dunes can also be found in the Fox Range WSA. In 1983 BLM recommended release of the entire 75,404 acres to uses other than wilderness.

[18] Detailed WSA information is from the *Nevada BLM Statewide Wilderness Report,* October 1991.

Selenite Mountains WSA. The Selenite Mountains WSA is 13 miles north to south and 3-5 miles east to west. There are some small juniper stands but there are no riparian areas. The main landforms are the ridge axis, the desert piedmont, and the footslope. In 1983 BLM recommended release of the entire 32,041 acres to uses other than wilderness.

Mount Limbo WSA. The BLM has recommended a portion of the Mount Limbo WSA be designated as wilderness. The 12,750 acres recommended for wilderness is free of human impacts. Some of the area that is recommended wilderness is rugged while other areas provide shade and solitude especially in stands of aspen.

China Mountain WSA. The China Mountain WSA is 7 miles north to south and 7-9 miles east to west. There are two main canyons, steep cliffs, and rolling hills. The vegetation is sagebrush and pinion-juniper. There are riparian areas along the canyon bottoms. In 1983 BLM recommended release of the entire 10,358 acres to uses other than wilderness.

Tobin Range WSA. The Tobin Range WSA is 6 miles north to south and 2-5 miles east to west. There are high elevations in Mt. Tobin, lower foothills, and a fringing piedmont desert. An earthquake in 1915 exposed a fault running along the foothill section. In 1983 BLM recommended release of the entire 13,107 acres to uses other than wilderness.

Pueblo WSA. The Pueblo WSA is located in Nevada and southern Oregon. The Nevada portion is 600 acres. In 1983 BLM recommended release of all the 600 acres in Nevada to uses other than wilderness.

Augusta Mountain WSA. The Augusta Mountain WSA is 17 mile north to south and 13 miles east to west. The area is composed of silicic ashflow tuff canyons, isolated patches of pinion-juniper stands, and the limestone peak of Cain Mountain. In 1983 BLM recommended release of the 89,372 acres in Nevada to uses other than wilderness.

3.13.2 Environmental Impacts

Wilderness and WSAs are withdrawn from geothermal resource leasing. No buffer zones are created around wilderness areas to protect them from the influence of activities on adjacent land. The fact that non-wilderness activities on uses can be seen or heard from areas within the wilderness does not, of itself, preclude such activities or uses up to the boundary of the wilderness area. When activities on adjacent lands are proposed, the specific impacts of those activities upon the wilderness resources and upon public use of the wilderness area must be addressed and assessed.[19]

3.13.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

[19] BLM Manual 8560, Management of Designated Wilderness Areas, dated April 27, 1983

Indirect Impacts – When considering the "reasonably foreseeable development scenario," there would be no impacts to the NCA under the Proposed Action Alternative. Site-specific EAs would be required before any action is undertaken when leases are granted under this plan. There could be potential setting impacts to the wilderness areas—two PVAs border the Black Rock Desert Wilderness Area and two lease applications are pending. PVA 3 borders the wilderness and is adjacent to two pending applications in the northwest of the wilderness. PVA 4 is to the southeast of the wilderness and surrounds McFarlin's Bathhouse Spring. Development outside of wilderness boundaries would have minimal impacts to wilderness values set forth in the Wilderness Act.

3.13.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.14 RANGE RESOURCES

3.14.1 Affected Environment

The laws that guide the BLM concerning livestock management on BLM administered lands in Nevada include the Taylor Grazing Act of 1934[20] and FLPMA.[21] Along with these laws, further guidance is provided for in 43 CFR Part 4100; more specifically subpart 4180 "Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration." The Standards and Guidelines for the assessment area were approved by the Secretary of the Interior on February 12, 1999.

Nevada is split into five grazing districts and three Resource Advisory Council (RAC) areas. The boundaries of these RACs are understood to be the areas used for ecosystem data collection and analysis of rangeland health. The three RAC are the Mojave-Southern Great Basin RAC, the Sierra Front-Northwestern Great Basin RAC, and the Northeastern Great Basin RAC. The assessment area falls under the Sierra Front-Northwestern Great Basin RAC (with the exception of Jakes Creek Allotment which falls under the jurisdiction of the Elko Field Office) and the Northeastern Great Basin RAC. BLM guidelines allows for adjustments to be considered for grazing areas that overlap boundaries of the RACs.

The Sierra Front/Northwestern RAC Standards and Guidelines were written to accomplish the four fundamentals of rangeland health. Those fundamentals are: watersheds are properly functioning; ecological processes are in order; water quality complies with state standards; and habitats of protected species are in order. The five standards for rangeland health as outlined in the Sierra Front-Northwestern Great Basin Area focus on the following: soils, riparian/wetlands, water quality, plant and animal habitat, and special status species habitat.

There are many grazing allotments within the assessment area. The grazing allotments are made up of public, private, and state lands. The public grazing lands in the assessment areas are administer by two BLM Districts; the Winnemucca Grazing District (established in October 18, 1935 and covers the majority of the assessment area) and the Carson City Grazing District (established on November 3, 1936 and covers two areas in the southeast of the assessment area: Boyer Creek and Copper Kettle Allotments). The Elko Grazing District was the first established on April 8, 1935 and administers one of the grazing allotments in the assessment area: Jakes Creek Allotment. Table 3.14-1 below sets out the grazing allotments by which the KGRAs, PVAs and hydrologic basins range areas intersect, the designated range number, and number of acres and Animal Unit Months (AUMs)[22] per allotment. A full AUM fee is charged for each month of grazing by adult animals if the grazing animal (1) is weaned, (2) is 6 months old or older when entering public land, or (3) would become 12 months old during the period of use.[23]

[20] Taylor Grazing Act of 1934 (43 USC §315; 4100 Series, as amended)
[21] Federal Land Policy Management Act (FLPMA) of 1976 (P.L. 94-579 (43 USC §1701; 36 CFR §2310.1-2; 1600 Series)
[22] An AUM is the amount of forage needed to sustain one cow, five sheep, or five goats for a month.
[23] Standards for Rangeland Health and Guidelines for Livestock Grazing Management, BLM, June 1999.

TABLE 3.14-1
AFFECTED GRAZING ALLOTMENTS

KGRA PVA	Hydrologic Basin	Range Number and Area	Range Allotment Name	Number of Acres	AUM
1	2	46 P	Pueblo Mountain Allotment	26,311	2,137
1	2	51 P	Alder Creek Allotment	17,819	5,913
1	2	65 P	Knott Creek Allotment	74,262	5,813
2	2	47 P	Wilder-Quinn Allotment	200,000	14,379
2	2	52 P	Dyke Hot Allotment	23,285	1,636
2	2	54 P	Pine Forest Allotment	124,910	9,215
2	2	55 P	Deer Creek Allotment	30,393	754
3	2	57 P	Paiute Meadows Allotment	177,096	3,550
4	2	58 P	Jackson Mountains Allotment	485,207	8,857
5	2	2 P	Cordero Allotment	5,956	197
5	2	3 P	Fort McDermitt Allotment	12,363	2,204
5	2	5 P	U.C. Allotment	44,312	12,902
5	2	10001 P	Washburn Allotment	31,529	1,464
5	2	205 P	McDermitt Creek Allotment	3,762	173
6	4	31 P	Buttermilk Allotment	28,490	3,525
6	4	68 P	Martin Creek Allotment	6,275	257
6	4	34 P	Spring Creek Allotment	22,590	2,488
6	4	32 P	Hot Springs Creek Allotment	53,135	1,770
7 & 11	4 & 2	116 S	Pumpernickel Allotment	124,934	9,417
7	4 & 2	101 S	Rock Creek Allotment	23,365	2,192
7	4 & 2	103 S	Melody Allotment	3,762	1,020
7	4 & 2	39 P	Iron Point Allotment	20,294	1,381
7	4 & 2	144 P	Diamond	18,625	1,203
7	4 & 2	143 S	White Horse Allotment	20,739	1,970
7 & 9	4 & 2	138 P	Humboldt Valley Allotment	103,616	2,900
7	4 & 2	61 P	Blue Mountain Allotment	59,827	2,315
7	4 & 2	60 P	Sand Dunes Allotment	86,636	3,865
7	4 & 2	42 P	Sand Pass Allotment	31,561	887
7	4 & 2	41 P	Golconda Butte Allotment	18,754	3,146
7	4 & 2	38 P	Osgood Allotment	50,080	4,971

KGRA PVA	Hydrologic Basin	Range Number and Area	Range Allotment Name	Number of Acres	AUM
7	4 & 2	37 P	Eden Valley Allotment	28,222	4,684
7	4 & 2	1016 P	Jakes Creek Allotment (Elko)	31,452	1,610
7	4 & 2	1009 P	Eleven Mile Flat	23,134	1,542
7	4 & 2	1034 P	White House	1,969	156
7	4 & 2	1032 P	Twenty Five	20,270	34,386
7	4 & 2	2145 S	North Buffalo Allotment	51,573	3,402
8	8,6,4,5	113 S	Humboldt Sink Allotment	68,985	1,582
8 & 9	8,6,4,5	131 S	Ragged Top Allotment	86,314	0
8	8,6,4,5	127 S	Buffalo Hills Allotment	271,018	4,114
8	8,6,4,5	135 S	Blue Wing-Seven Troughs Allotment	772,006	4,775
8	8,6,4,5	137 S	Desert Queen Allotment	123,161	3,355
8	8,6,4,5	129 S	Rodeo Creek Allotment	193,402	5,542
9	4	112 S	Humboldt House Allotment	23,837	728
9	4	115 S	Prince Royal Allotment	10,425	97
9	4	106 S	Rye Patch Allotment	40,123	1,981
9	4	104 S	Coal Canyon-Poker Allotment	97,265	3,144
10	10	124 S	Klondike Allotment	50,321	4,610
10	10	119 S	Rawhide Allotment	122,631	2,740
10	10	118 S	Star Park Allotment	84,091	3,294
11	4	109 S	Clear Creek Allotment	55,455	1,304
11	4	105 S	Goldbanks Allotment	37,460	2,112
11	4	121 S	Dolly Hayden Allotment	77,904	864
12	10	117 S	South Rochester Allotment	175,457	3,964
13	10	142 S	South Buffalo Allotment	234,335	122
13	10	114 S	Pleasant Valley Allotment	174,543	10,553
13	10	148 S	Jersey Valley Allotment	66,517	917
DV	10	3030 S	Hole in the Wall	84,204	1,224
DV	10	Carson	Boyer Ranch	74,555	1,790
DV	10	Carson	Copper Kettle	127,194	2,333

Carson = Carson City Field Office; DV = Dixie Valley; P = Paradise-Denio; S = Sonoma-Gerlach

Most of the grazing areas in the Paradise-Denio area are cattle and horse operations. One exception is the Jakes Creek Allotment, which graze sheep. The Sonoma-Gerlach grazing areas are a mixture of cattle and sheep operations.

The assessment area does not completely encompass the grazing areas. Some grazing areas intersect the assessment area in very small portions of the PVAs or KGRAs. See Figure 3.14-1 for a pictorial description of the grazing areas in relation to the PVAs and KGRAs.

3.14.2 Environmental Impacts

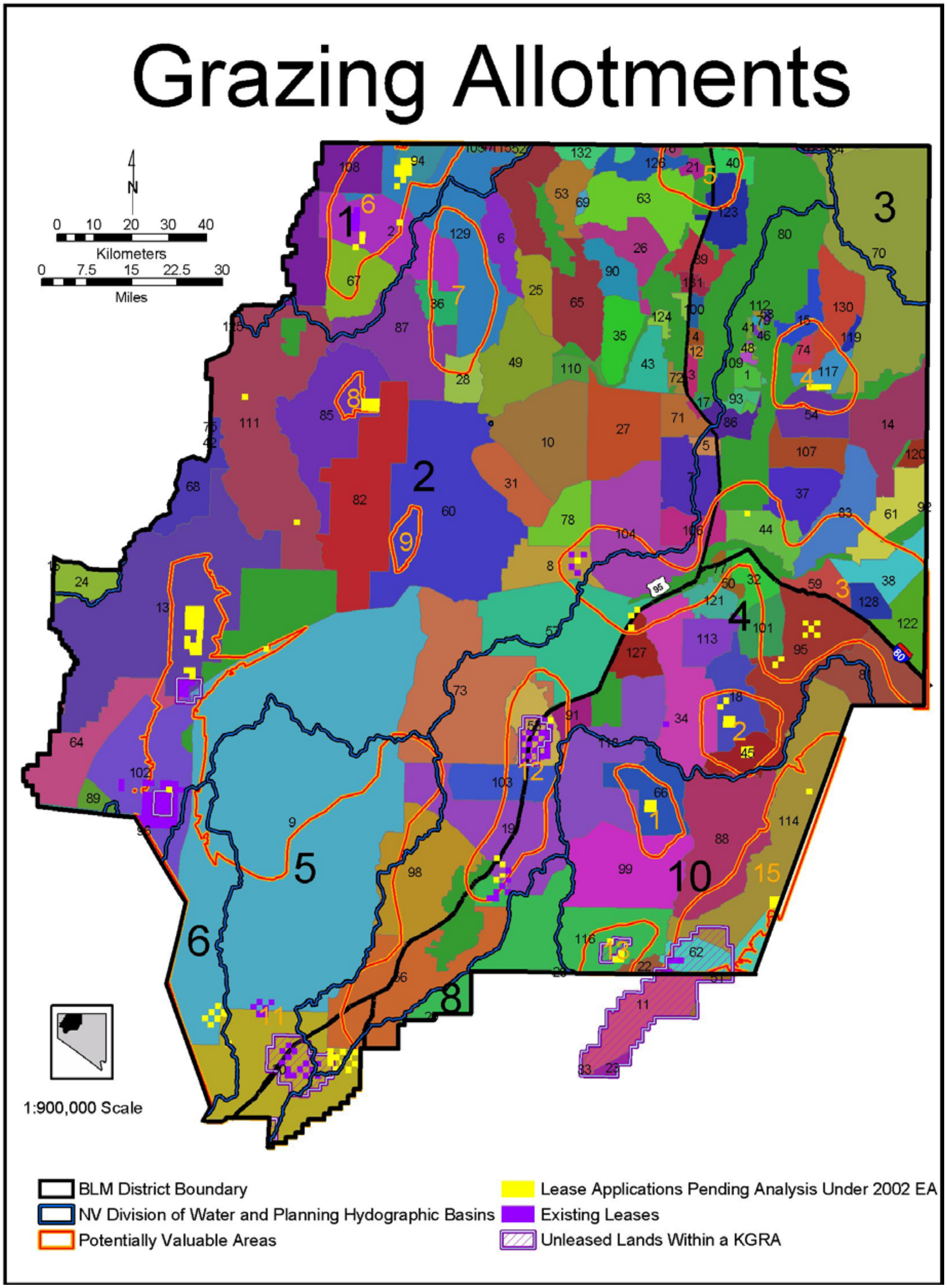
Potential impacts on some of the allotments depend on the location of development in relation to the grazing areas. There is also potential for cumulative impacts in the PVAs, KGRAs and hydrological basins with multiple hot springs or accessible geothermal areas. Impacts to range resources would include any activity that would decrease the AUM number, thus decreases the amount of livestock that could forge within an allotment. The decrease in livestock would coincide with the area(s) of disturbance.

TABLE 3.14-2
DESIGNATION OF RANGE ALLOTMENTS*

Range No. and Area	Range Allotment Name	Range No. and Area	Range Allotment Name
34 P	Spring Creek Allotment	109 S	Clear Creek Allotment
38 P	Osgood Allotment	116 S	Pumpernickel Allotment
39 P	Iron Point Allotment	124 S	Klondike Allotment
41 P	Golconda Butte Allotment	129 S	Rodeo Creek Allotment
46 P	Pueblo Mountain Allotment	135 S	Blue Wing-Seven Troughs Allotment
47 P	Wilder-Quinn Allotment	137 S	Desert Queen Allotment
51 P	Alder Creek Allotment	142 S	South Buffalo Allotment
68 P	Martin Creek Allotment	1034 P	White Horse Allotment
101 S	Rock Creek Allotment	Carson	Boyer Ranch
105 S	Goldbanks Allotment		

Carson = Carson City Field Office; P = Paradise-Denio; S = Sonoma-Gerlach
* Allotments are either totally encompassed, or have more than half their areas within the assessment area.

FIGURE 3.14-1
GRAZING ALLOTMENTS



3.14.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the “reasonably foreseeable development scenario,” the indirect impacts to range resources would be addressed in site-specific EAs tiering off this PEA. As such, environmental and range concerns would be addressed on a more intimate level, taking into consideration equipment placement and roads that would create the least disturbance. Mitigation measures would be addressed in individual EAs as is appropriate to each lease application.

The following are the potential environmental impacts on range resources when analyzing the “reasonably foreseeable development scenario.”

Exploration. The impacts on range resources during the exploration phase would be minimal. Geothermal activities during this phase are short in duration and limited to a very small area.

Development. The impacts on range resources during the development phase would also be minimal; however, more broad and longer in duration. Geothermal activities would have no adverse effects on grazing or other range resource uses.

Production. The impacts on range resources during the production phase would be less that that of the development phase. Even though the production phase would expect to last several decades, the surface area impacted would be extremely small as related to the entire range resource.

Close-Out. The impacts on range resources during the close-out phase would be minimal. These geothermal activities would be short in duration and limited to the already disturbed areas.

3.14.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.15 CULTURAL RESOURCES

3.15.1 Affected Environment

People and the environment are inextricably linked throughout time. Most human activities, such as resource extraction, occupation, and spirituality, leave traces that result in an archaeological record. Interpretation of these material remains characterizes the cultural history of a given area. Numerous authors have proposed cultural sequences for the Great Basin. Perhaps the best comprehensive work is D'Azevedo's (1986) *Great Basin* volume. He organizes the Great Basin into natural and cultural provinces that contributing authors use to synthesize the region's prehistory, ethnology and history. Elston (1986:135-148) describes the prehistory of the "Western Area" that encompasses all the geothermal assessment areas. Fowler and Liljeblad (1986:435-465) and Thomas et al. (1986:262-283) provide the ethnology for the area. Multiple authors describe the history. The following information is summarized primarily from these documents. In addition, Grayson's *The Desert's Past: A Natural Prehistory of the Great Basin* (1993) and other resources were utilized (e.g., Smith et al., 1983; Steward, 1938). These references should be consulted for information that is more comprehensive.

Numerous prehistoric archaeological sites with widely varying degrees of complexity, size, location, and densities occur within the geothermal assessment areas. These include rock shelters, occupation sites (with probable buried deposits), temporary camps, petroglyphs, hunting blinds, toolstone quarries, and lithic scatters. Similarly, historic sites express a great deal of variation reflective of the activities that drew historic period peoples into the area. Mining sites, historic trails, ranches, towns, and ethnic occupations are among them. The following cultural history provides a broad-based framework for understanding the area's cultural resources.

3.15.1.1 Cultural History

Early Man Tradition (11,500-11,200 B.P.). To date, no sites older than 11,500 years before present (B.P.) have been confidently dated within the Great Basin. While there have been claims of earlier dates, most have been rejected because of inadequate data or dating techniques. Advocates of Early Man believe that the lithic technology predated "well-flaked" bifaces and projectile points, making it difficult to recognize early sites.

Paleoindian (11,200-10,900 B.P.). To the east and south of the Great Basin, the earliest archaeological sites are named Clovis, because they are associated with distinctive fluted points dating to between 11,200-10,900 years ago. Found throughout the Great Basin, fluted points are typically associated with the earliest occupations of the New World. However, because all of these finds have been on the surface and have no stratigraphic association, these interpretations are still in question. While most archaeologists assume that the Great Basin fluted points are the same age as those found elsewhere, some argue that these claims are not justified. Another problem with the Great Basin fluted points is their variability. Some, but not all, of this variability may be the result of re-sharpening the points. In the past, many Great Basin archaeologists argued that the people who made these points were big game hunters. Again, these interpretations focus on the spectacular Clovis sites of the Southwest and Plains, where fluted points were closely associated with the remains of extinct animals. However, in the Great Basin many fluted points are found along the shores of highly productive shallow-water environments above now extinct Pleistocene lakes.

Some of the oldest prehistoric occupation in the area, dating to as early as 10,000-12,000 years ago, includes artifact assemblages found in the Black Rock Desert. Although the Black Rock Desert is excluded from geothermal leasing, these finds have led to speculation that big game hunting sites may exist in the area. The region contains large deposits of Pleistocene megafauna (such as wooly mammoth and bison) in proximity to artifacts that may be associated with early occupation of the region. These finds have generated considerable scientific interest in the area. In particular, a large, concave base projectile point is characteristic. The so-called “Black Rock Concave Base” points are very similar to Clovis points, but do not feature the flutes that are typical of the Clovis culture. These points are similar in shape and feature the basal and edge grinding characteristic of Clovis points. In addition, unique “crescent” points/tools are typical; many of these are held by private collectors. Though these tools’ functions are unknown, some archaeologists call them “Great Basin Transverse Points,” and believe their function was to stun birds. This assumption stems from the fact that many feature grinding or steep retouch along the central portion of the tool. In the Mojave Desert, these tools are found in association with Lake Mojave and Silver Lake points along the shores of Pleistocene Lake Mojave (Campbell et al., 1937). Thus, it is unclear if they are associated with Paleoindian or subsequent Paleoarchaic occupations.

Paleoarchaic (11,200-7500 B.P.). The paleoarchaic tradition covers the period during which Pleistocene lakes were retreating and becoming a series of small, shallow lakes and marshy areas. The lithic traits include stemmed points variously termed Lake Mojave and Silver Lake; these named types are just some of the appellations Great Basin archaeologists have assigned to stemmed points of this tradition. In the area, one of these types is called Parman. Most of these points feature thick stems that contract to a rounded or square base. Many have distinct shoulders separating the stem from the blade portion of the point. Another trait typical of these points is edge grinding, a characteristic shared with fluted points. This grinding keeps the material binding the point to its shaft from fraying or breaking. Because these various points share so many characteristics, they are routinely grouped together as "Great Basin Stemmed" points. A Variety of other tools make up the Paleoarchaic kit. The previously defined "crescent" is a distinct trait of this tradition. Archaeologists have not shed much light on this tool’s function. Charlotte Beck and George T. Jones (1990) analyzed 95 Great Basin Stemmed points and 174 crescents from seven sites in Nevada and Oregon. They found that obsidian was preferred for the points (85 percent), while chert was used to produce 94 percent of the crescents in their sample. This raw material preference suggests that whatever the function of crescents, they required a durable stone. Other tools forming the Paleoarchaic toolkit are large bifacial knives, gravers, punches, choppers, and several types of scrapers with steep, well-formed edges. Multifunction tools are common. Small numbers of grinding tools such as metates and manos also occur.

Like the previous Clovis tradition, many Paleoarchaic sites are situated along the shores of lakes or marshes, or along streams that fed these lakes and marshes. However, the known distribution of stemmed point sites indicates Paleoarchaic people utilized a broad variety of resources from a set of environments much wider than during previous times. Within the area, the Sadmat site artifact assemblage provides a good example of the Paleoarchaic toolkit. Located in the Carson Sink, the site comprises an area of about two square miles that is littered with weathered tools and flaking debris (Tuohy, 1968, 1981).

Early Archaic (7500-4000 B.P.). At about 7,000 years ago, most of the low-elevation valley lakes had dried up, which significantly reduced their biological productivity. Along with climatic change came dramatic cultural change. The so-called "good times" (Elston, 1982) were over and what came after was very different. During the Middle Holocene (7,500-4,500 years ago), a much more arid climate prevailed. In fact, this period may have been even drier than that of today (the Altithermal of Antevs). Broad-based subsistence practices become the norm, utilizing desert and mountain as well as lacustrine resources. One of the most archaeologically visible differences is the prevalence of grinding tools. Most have associated this prevalence with increasing dependence on plant foods, seeds in particular.

Very few archaeological sites can be reliably dated to the middle Holocene (see Grayson 1993, Table 9-1 for a list of some Great Basin middle Holocene sites). Grayson believes that one explanation for the lack of dated sites is that people made less use of caves during this time than they had in the past (1993:248-249), and of course, most radiocarbon dates come from cave deposits. Previously used cave sites adjacent to Pleistocene lakes became less attractive. As the lakes desiccated, people had no reason to remain at these locations. In fact, given the generally dry conditions, sites near springs or other permanent water supply made much better sense. Warren (1980) and others associate the beginnings of the early archaic with the appearance of Pinto projectile points. While some have confused these points with the "Gatecliff" style points defined by Thomas (1981), many have recognized that Pinto points are very different (Grayson, 1993:254-255). In the Mojave Desert Pinto points date to circa 7000-9000 B.P., but there is not enough evidence of their presence in the western Great Basin to firmly establish them as markers for the Early Archaic. This may be because the extreme aridity characteristic of the middle Holocene meant an extremely sparse population utilized many areas of the Great Basin.

In the Lahontan Basin, the evidence is scarce for the earliest parts of the Archaic. Originally considered the type-site for the "Humboldt Culture", work at Hidden Cave (Thomas, 1985) has failed to provide such evidence. Some sites along Winnemucca Lake returned dates within this range. At Shinners Site I in Falcon Hill, organic debris from Guano Cave yielded a date of 6550 B.P., while a cedar-bark robe from a desiccated burial in Cowbone Cave dated to 5720 B.P. (Heizer and Hester, 1978; Hattori 1982). An infant burial from Leonard Rockshelter dates to 5787 B.P. (Grosscup, 1958; Heize,r and Hester, 1978). First occupation at the Silent Snake Springs site occurs at about 6100 B.P., when the site served as a base camp for hunting mountain sheep. During later parts of the Early Archaic, archaeological evidence increases. Intermittent use of Lovelock Cave begins about 4630 B.P., although intensive occupation occurs later. Kramer Cave in Falcon Hill at Winnemucca Lake (Hattori, 1982) and Hidden Cave in the Carson Sink (Thomas, 1985) were used intensively during times when lakes filled the Winnemucca Basin and Carson Sink and lacustrine resources appeared. Both were occupied from about 3,900-3,600 years ago and most of the projectile points are in the Humboldt or Gatecliff Series. These sites, and others such as Lovelock Cave and Hanging Rock Cave, were not used as permanent residences, but instead for burials and caches of equipment and goods needed during the seasonal round. Because of these locations were non-residential, little debitage or food waste was recovered during excavation. Instead large numbers of baskets, nets, fur and birdskin robes, atlatls and darts, mats, cordage and other perishable goods, finished lithic tools such as projectile points and knives, bone awls, and ornaments were found.

Middle Archaic (4000-1500 B.P.). Elston describes the climate for the Middle Archaic as cool and moist (1986:141). Some have defined it as neoglacial or neopluvial (Davis, 1982; Weide, 1982). While high altitude resources may have been inaccessible during this time, the formation of meadows, marshes, and shallow lakes where they had not been before surely offset this. Large technological shifts are not apparent during the transition from Early to Middle Archaic. The main changes seem to be in settlement and subsistence patterns, stylistic elaboration, and population density (Elston, 1986:142).

In many places, reoccupation of winter sites and seasonal base camps through long periods is typical. Pit houses range from two to four meters in diameter, contain interior features such as hearths, storage pits, and burials. The diversity of resources utilized is greater during the Middle Archaic. Elston believes this may be attributed to the extensive exploitation of particular ecozones. While big game hunting remained important, grinding stones and bones of smaller animals suggest a wider variety of subsistence activities.

Characteristic Middle Archaic artifacts include Northern Side-notched, Elko and Gatecliff series points, along with knives, grinding tools, scrapers, and wooden darts and atlatls. A distinctive basketry known as Lovelock Wickerware first appears at this time. Heizer and Baumhoff have postulated that certain styles of rock art also date to this period (1962). Trade in exotic materials such as marine shell and obsidian also becomes important during the Middle Archaic.

Lowland areas seem little used, while higher elevations appear more extensively exploited. Lacustrine specialization continues and intensifies at the mouths of the Humboldt and Truckee rivers. Cache and burial sites such as Humboldt Cave, Lovelock Cave, and the Winnemucca Lake sites continue in use. Many of these sites feature well-defined pit houses with central hearths, cache pits, and sometimes burials in the floors. These date between 3065 and 2130 B.P. Other sites dating to this period include the Rye Patch Reservoir sites along the Humboldt River. These are a series of short-term base-camps where seed processing implements are common, as are the remains of a variety of fauna from minnows to large game animals. Conversely, at the Barrel Springs site mountain sheep bones are numerous, large bifaces production was a major activity, and relatively few seed processing tools were recovered (Cowan and Thomas, 1972).

Late Archaic (1500-200 B.P.). A warming and drying trend began sometime around 2,000 years ago. It reached its peak in this period, although it appears to have been relatively mild when compared with the Early Archaic. Important cultural changes occurred during the Late Archaic. Elston believes that, while climate change may have triggered cultural change, population stress probably provided the main impetus for change. Many archaeologists equate these cultural changes to a postulated "Numic expansion" out of the southwestern Great Basin. Others reject this hypothesis. Glottochronological theories first espoused by Swadesh (1952, 1954) and later elaborated by Lamb (1958) fueled the idea of a Numic expansion. Grayson (1993) provides a thorough discussion of problems associated with the postulated Numic spread.

He accepts that all Numic languages are closely related and that Numic-speakers expanded across the Great Basin, but he does not believe the data support the idea that the linguistic splits within the various Numic branches occurred only 1,000 years ago. Grayson argues that the causes driving the cultural changes at about 1000 B.P. are unclear.

During the Late Archaic, the bow and arrow replaced the atlatl and darts throughout the Great Basin. Previously, lithic technology focused on biface production and the use of quarried raw materials. Production of simple flake tools from locally available materials replaces the earlier technology. About 1,500 years ago, small, triangular arrow points (e.g., Rose Spring and Eastgate) are first used. After about 900 years ago, Desert Series projectile points are characteristic. At this same time, an elaborate plant processing technology develops. Subsistence strategies focus on increasingly diverse resource categories within a varied range of ecozones. In addition to the varied plant foods, small game animals become a focus of hunting strategies.

Villages occupied at the mouths of the Truckee and Humboldt Rivers continue during the Late Archaic, but houses are smaller, shallower, and lack internal features. Humboldt Cave, Granite Point Cave, and Granite Point Shelter continue in use, as do several of the Winnemucca Lake sites. Many of these sites are used for burials and to cache goods, rather than for permanent occupation. Various zones continue to be used, although certain sites, such as Barrel Springs, and Karlo, are abandoned. At Rye Patch Reservoir, Rusco and Davis (1982) document occupation at a series of temporary base camps, although they see considerable shifts in subsistence practices. The greatest variety of fauna recorded at any time in the prehistoric sequence is typical of the Late Archaic there.

Ethnographic (200 B.P. to c. A.D. 1940). The ethnographic Northern Paiute and Western Shoshone occupied the western Great Basin when historic-period peoples first ventured into the region. Julian Steward's influential monograph, *Basin-Plateau Aboriginal Sociopolitical Groups* (1938), documents the complex and diverse adaptive practices followed by these groups. Subsistence activities were very broad during this period exhibiting a diverse mixture of forager and collector strategies (Thomas et al., 1986:265-268). Gathered plant resources such as seeds, roots, and berries formed the caloric nucleus of the aboriginal diet, but bighorn sheep, antelope, deer, and smaller mammals provided much needed protein as well as hides for clothing and blankets. Whenever possible, both the Shoshone and Paiute incorporated reptiles, birds, insects, and fish into their systematic but flexible seasonal subsistence round (Fowler and Liljblad, 1986; Grayson 1993; Thomas et al., 1986).

Highly mobile, native populations constructed their houses of readily available materials. Usually temporary, the favored house form was a conical or dome-shaped hut constructed of poles and covered with brush, grass, or woven mats. Winter structures were typically more substantial than the shelters used during the warmer months (Wheat, 1967).

Because of the relatively harsh environment, these aboriginal groups organized around the nuclear family or extended family unit. The sparse and unpredictable resource bases supported these smaller groups most of the year, although multiple family units would gather 2-3 times a year for communal hunts and congregate in winter villages. The winter villages may have contained as many as 15-20 families (100-150 individuals) and were usually located at the lower edge of pinyon-juniper zone, canyon mouths, or along valley bottom springs or streams. Winter village sites in the assessment area occurred near permanent water sources such as the Humboldt River (Elston, 1982:135-148; Smith et al., 1983:11). Steward (1974:70) references Park et al. (1938:622) who describes a Northern Paiute band that "usually wintered along the Humboldt River from the [Humboldt] lake to the present site of Winnemucca. Thus, PVAs, KGRAs or pending lease applications along the Humboldt River could contain the remains from winter villages. In addition, Paiutes would sometimes spend the winter in the mountains including the Stillwater Range (McGuckian, 1996:100; Park, 1989:10; Stewart, 1941:374; Wheat, 1967) where pending lease applications, the New York Canyon and Dixie Valley KGRAs, and PVA 12 are located. The Stillwater Range was, and continues to be, used by the Northern Paiutes for pine-nutting. There are pine nut camps in the Stillwater Range as well as a route used by the Native American Indians to access the Stillwaters from Lovelock (McGuckian, 1996). Pending lease applications, the New York Canyon KGRA, and PVA 12 may intersect these. The pine-nutting route is also in the Rye Patch KGRA and PVAs 7 and 9.

While Steward's research (1938) indicates that much of the traditional aboriginal life way persisted after European contact, other researchers (Grayson, 1993; Service, 1962) suggest that key aspects of native people's social and economic organization quickly fell into disarray. Disease, territorial encroachment, and introduction of new technologies and ideas significantly affected the cultural practices of aboriginal populations. Population decline caused by disease, depletion of native food sources, and access restrictions to traditional resource procurement and ceremonial areas resulted in the abandonment of many long-established sites. As Grayson (1993:39) notes "Great Basin natives quickly became peripheral hangers-on in American towns." Historic accounts record the establishment of Indian settlements on the outskirts of many of the mining and ranching communities in the Great Basin. Purser (1987) and Marshall (1995) recount the Paiute's establishment of seasonal camps near farms and cattle ranches in Paradise Valley. Indian people found employment as laborers or domestics gradually becoming part of the American wage-labor system.

The continuing influx of settlers into the Great Basin eventually led to hostilities resulting in the forced consolidation of native peoples into colonies or reservations, although many Shoshone and Paiute refused the resettlement efforts (Fowler and Liljeblad, 1986:457). There are no Indian colonies or reservations in the assessment areas. The following reservations, colonies, and rancharias are near the assessment areas: Fort McDermitt Reservation, the Winnemucca Colony, the Lovelock Paiute Colony, Pyramid Lake Paiute Reservation, the Summit Lake Reservation, the Fallon Paiute Reservation, and the Battle Mountain Shoshone Band. Fort McDermitt Reservation, established around 1892, also has Western Shoshone residents (Clemmer and Stewart, 1986:532-533). Reservation life and colonization further weakened connections with pre-contact practices especially subsistence strategies and political organization. Other traditional cultural practices remained strong. Fowler and Liljeblad (1986:460) note that social organization changed little among the Northern Paiutes. While shamanism has declined, most tribal groups still have traditional practitioners.

Historic (A.D. 1828-Present). In 1828 Peter Ogden entered the region. From 1828-1833 trappers frequented the Humboldt River, opening the way for the first emigrants who passed through the area to reach California and Oregon. Settlement began in the 1860s as a result of the overflow from California mines, particularly around the Comstock Lode. In the WFO, the Humboldt Range drew the miners. Mining brought various support industries, which eventually fostered a permanent population base. Ranching and farming became major industries resulting in the creation of grazing laws, reclamation projects, and new technology.

Historic events within the area helped mold and change the course of American history on a national scale. Captain John C. Fremont led the first Federally-sponsored exploration of the area in 1843. Two years later, he divided his party sending the larger segment (led by Joseph Walker) down the Humboldt to its sink while he led his segment over the Sierras near Truckee. According to Smith et al. (1983:81), no physical traces of the Fremont route remain in the area.

Prior to Fremont, emigrants ventured through the area following routes established by trappers. However, in 1846, the Applegate-Lassen Trail was established. Initially, the Applegate party created a cutoff from Fremont's Humboldt route. Later the same year, Peter Lassen's cutoff modified the Applegate route. Although mostly outside the affected environment, the viewshed associated with the Applegate-Lassen Trail could be affected which, in turn, could affect integrity of setting. The same may be true for other trails in the area used by emigrants up through the late 1860s. The Oregon-California Trail Association has documented most of the physical traces of the California Trail in the area (McGuckian, 2002). Along the Humboldt River Route, Winnemucca, Pallen's Well, and Big Meadows of Lovelock stand out. The Carson River Route includes the Humboldt Dike, Double Wells, and the Humboldt Slough. Brady Hot Springs, Table Mountain, and White Plains stand out as markers along the Truckee River Route. In addition, a stop along the 1856 Nobles Route includes Trego Springs.

These early emigrant traces are interesting for migration studies but significant area settlement did not begin until the 1860s. Mining, particularly in the Humboldts, drew multitudes of prospectors. Ranching activities and other businesses followed shortly thereafter.

Among the earliest mining in the area were the copper operations at the south end of the Eugene Mountains. Starting in the early 1850s, copper ore extracted from the mines was shipped to San Francisco. The discovery of silver in the Humboldts in 1860 resulted in hoards of miners moving in from California and the Comstock Lode region. Mills established along the Humboldt and included Rye Patch, Torreytown, Oreana, and others. Unionville, Star City, and other smaller mining towns popped up almost overnight. But typical of boom and bust cycle of mining, many of the early towns folded with the mining strikes of the 1860s and most others failed by the 1890s. Several more booms followed including resurgences in the early 1900s, 1930s, and 1950s.

Following the Civil War, the United States created many military outposts in the West to absorb the standing army and protect mail and freight routes in an expanding country. Camp McKee at Granite Creek Station, and Fort McDermitt on the East Fork of the Quinn River were two such military facilities. Located north of Gerlach, Camp McKee was established in 1865 on the 1852 Nobles Route after an Indian raid. Primarily a tent compound, two major stone foundations still remain at the Camp McKee/Granite Creek Station site (Carlson, 1974:161). Like McKee, Fort McDermitt was created in 1865. The abandoned stone, adobe, and frame buildings from the original compound were renovated when the land became part of the Fort McDermitt Indian Reservation in 1889. Several of these structures remain standing (Pahrer, 1970:151).

By the 1870s, large numbers of cattle, and later sheep, were driven throughout the region. Homesteaders followed the early ranchers. Some tried to farm low lands and others were agents for large ranching operations. Paradise Valley, established in the 1860s, was the site of some of the earliest ranches in the state (Marshall, 1995). Some of these are still in use by current ranching operations. A flourishing agricultural community, Paradise Valley attracted immigrants representing a variety of ethnic backgrounds. Initially, Germans, Italians, and Basques settled in the valley. Later, after work on the Transcontinental Railroad finished, Chinese immigrants found their way to Paradise Valley. The valley even had its own small "Chinatown" between 1875 and 1905 (Marshall, 1995:11). Traces from these early settlers remain as wood and stone houses, foundations, irrigation systems, and fences. Several buildings reflecting the work of an Italian stonemason are listed on the National Register of Historic Places (Smith et al., 1983:94).

Agricultural production in the area remained fairly stable until the 1929 stock market crash caused multiple bankruptcies. World War II revived agricultural production in the area. Cattle ranching dominated the livestock industry and it continues to be the primary livestock product.

Railroads were a key element in the growth of many of the communities and commercial centers in the WFO District. The influx of capital, goods, and people accompanying the establishment of a rail line or depot, helped many mining towns survive the boom and bust cycle. Winnemucca began as a small trading post in 1863, but flourished as a transportation hub and commercial center when the Central Pacific Railroad reached the community in 1868. Within a decade, Winnemucca became the Humboldt County seat. Lovelock and Golconda, also benefited from the Central Pacific's presence. Between 1907-1909, the Western Pacific Railroad built another transcontinental line through northern Nevada. Gerlach, established as a depot on this line at that time, remains largely supported by railroad activities today.

Transportation growth continued in the area and by 1917 the route now followed by Interstate 80 was established. Originally a combination of abandoned sections of the Central Pacific Railroad and parts of the California Emigrant Trail—much of it unpaved—became State Route 1 or U.S. 1 (also known as the Victory Highway). In 1926 it was designated U.S. 40.

Mining, ranching and railroad construction all helped draw significant numbers of immigrants to Northern Nevada. As Wilbur Shepperson (1970) notes "[o]n a percentage basis Nevada was the largest foreign-born state in America for two decades following the Civil War." Winnemucca, Lovelock, Golconda, Paradise Valley, and the surrounding regions all had substantial immigrant populations (see Marshall, 1995; Shepperson, 1970; and Smith et al., 1983 for a more detailed discussion).

Available Data. The affected environment encompasses cultural resource sites within lease applications, KGRAs, and PVAs. These are organized geographically by hydrographic regions. The following data were compiled from records maintained at the WFO and electronically formatted data from the Nevada State Museum (provided for this project courtesy of the Nevada State Historic Preservation Office). The latter is part of an on-going project to digitize the state's cultural resources database and has not yet been subject to a quality assurance review. Combined these data provide information on the sites and surveys within the specific units of analysis. Table 3.15-1 summarizes the available data. See Appendix D for additional detail.

TABLE 3.15-1
SURVEYS AND SITES WITHIN GEOTHERMAL ASSESSMENT AREA

Hydrographic Basin	Analysis Unit	Surveys (Acres/Percent)		Cultural Resources		
		Class II	Class III	Eligible	Ineligible	Undeterm.
Northwest Region	PVA 1	2,870 (1.5%)	88,874 (48.9%)	-	29	44
	N Lease App	50 (0.1%)	6,442 (92.7%)	2	3	12
	S Lease App	5 (<0.1%)	456 (9.8%)	-	11	11
	E Lease App	none	641 (100%)	-	-	-
Black Rock Desert Region	PVA 2	11,567 (7.8%)	23,026 (15.6%)	-	10	26
	PVA 3	none	58.5 (0.3%)	-	2	-
	Lease App	none	none	-	-	-
	PVA 4	4,002 (18.9%)	117 (0.5%)	-	19	5
	PVA 5	57 (<0.1%)	3,053 (4.1%)	-	12	32
	Gerlach KGRA	none	2,190 (22.7%)	2	16	27
	Lease App	none	3,007 (14.4%)	9	5	65
	San Emidio KGRA	none	1,247 (16.2%)	6	21	6
	Lease App	none	2,005 (6.5%)	10	27	62
Humboldt River	PVA 6	none	444 (0.4%)	-	4	41
	Lease App	none	34 (1.3%)	-	1	9
	PVA 7	1,260 (0.1%)	46,971 (6.9%)	13	186	313
	N Lease App	none	617 (96.8%)	-	2	-
	S Lease App	none	8 (0.6%)	-	-	1
	E Lease App	none	none	-	-	-
	W Lease App	none	37 (0.7%)	-	-	-

Hydrographic Basin	Analysis Unit	Surveys (Acres/Percent)		Cultural Resources		
		Class II	Class III	Eligible	Ineligible	Undeterm.
	PVA 8 Lease App near Brady KGRA	4,466 (62.6%)	151 (2.1%)	-	-	-
	PVA 9	10,907 (5.4%)	15,667 (7.8%)	28	132	195
	Rye Patch KGRA	none	6,535 (33.6%)	16	56	38
	Lease App	3,147 (24.7%)	4,948 (38.8%)	7	15	38
	PVA 11	none	6,403 (6.8%)	-	11	9
	Lease App	none	216 (4.1%)	-	1	1
West Central Region	PVA 8	27,397 (2.0%)	27,626 (2.1%)	21	265	124
	Brady KGRA	none	2,596 (5.3%)	3	3	18
	Lease App	none	862 (6.0%)	1	18	7
	Hazen KGRA	none	none	-	-	-
Truckee River	PVA 8 Lease App	none	71 (1.5%)	-	-	-
Central Region	PVA 10	84 (0.1%)	523 (0.8%)	-	-	1
	Lease App	24 (0.9%)	41 (1.5%)	-	-	-
	PVA 12	none	994 (1.9%)	-	10	1
	NY Canyon KGRA	none	286 (3.8%)	-	-	-
	N Lease App	none	18 (2.7%)	-	-	-
	S Lease App	none	none	-	-	-
	PVA 13	1,987 (0.7%)	4,726 (1.7%)	5	34	43
	Dix Valley KGRA	1,987 (1.0%)	481 (0.2%)	1	3	22
	N Lease App	none	none	-	-	-
	S Lease App	none	25 (0.9%)	-	-	3

3.15.1.2 High Sensitivity Model for Cultural Resources

To develop a more full understanding of the occurrence of significant cultural resources, a model of high sensitivity areas for National Register of Historic Places (NRHP)-eligible properties was created (see Figure 3.15-2). The model focused on three factors associated with recorded NRHP-eligible properties: distance to permanent/semi-permanent water, elevation (as reflective of environment) and slope. An additional sensitivity for viewshed associated with historic trails was also created and mapped.

In the desert environment, permanent and semi-permanent water sources are perhaps the most significant environmental factor in cultural settlement patterning. Prehistoric and historic peoples depended on them directly for hydration and other uses. They also depended on these water sources indirectly for their association with other resources (i.e., game). The strength of association between cultural sites and water led to using a 500m buffer around all permanent and semi-permanent water sources regardless of other factors.

Beyond 500m, slope and elevation were analyzed for their contribution to a sensitivity model. An analysis of eligible historic and prehistoric properties indicated that significant groupings of properties occur at distances of up to 1,500m from water sources between 3,800 feet and 6,300 feet elevation and at a slope of less than 15 degrees. Field checks at two lease applications support the model. The lease application at Leach Hot Springs (serial number NVN 074276) indicated evidence of historic use at the springs (within the 500m radius). It included the foundation of a structure built over one of the springs, purple and blue glass shards, glazed ceramic sherds, and a scatter of metal fragments. A few flakes also were observed indicating prehistoric use of the area though not substantial. The lease application at The Hot Springs in Paradise Valley (serial number NVN 074656) yielded evidence of historic and prehistoric use within 500m of the springs. Due north of the springs, a casual inspection revealed chert and obsidian flakes as well as metal fragments, cans and glazed ceramics (whiteware). West of the springs, but within 500m of a stream, a carved rock house (listed on the USGS 7.5' quadrangle as a gauging station) appears to have been a home. The number "1891" is carved in the rock above the door and presumably refers to the date of construction. At a further distance from the water (500-1,500m), where the elevation and slope lie within the parameters of the model, two flaked tools (probably scrapers), debitage, and a historic ditch were observed.

A field check was also performed at distance of 2,500-3,500m from the Leach Hot Springs in an area that lies within the elevation and slope parameters because an earlier version of the model suggested a relationship between historic period sites and that distance. However, that relationship appears to be spurious. No cultural materials greater than 50 years old were observed in the area. The 2,500-3,500m distance from water was dropped from the model.

This model does not account for significant cultural resources independent of these environmental factors. Geologic data, for instance, may be useful in analyzing rockshelter locations, mining activities, and/or prehistoric quarry sites. Archival research can specify trails, town sites, ranches, etc. Table 3.15-2 provides sensitivity issues by geothermal analysis units.

FIGURE 3.15-1
CULTURAL RESOURCES SENSITIVITY AREAS

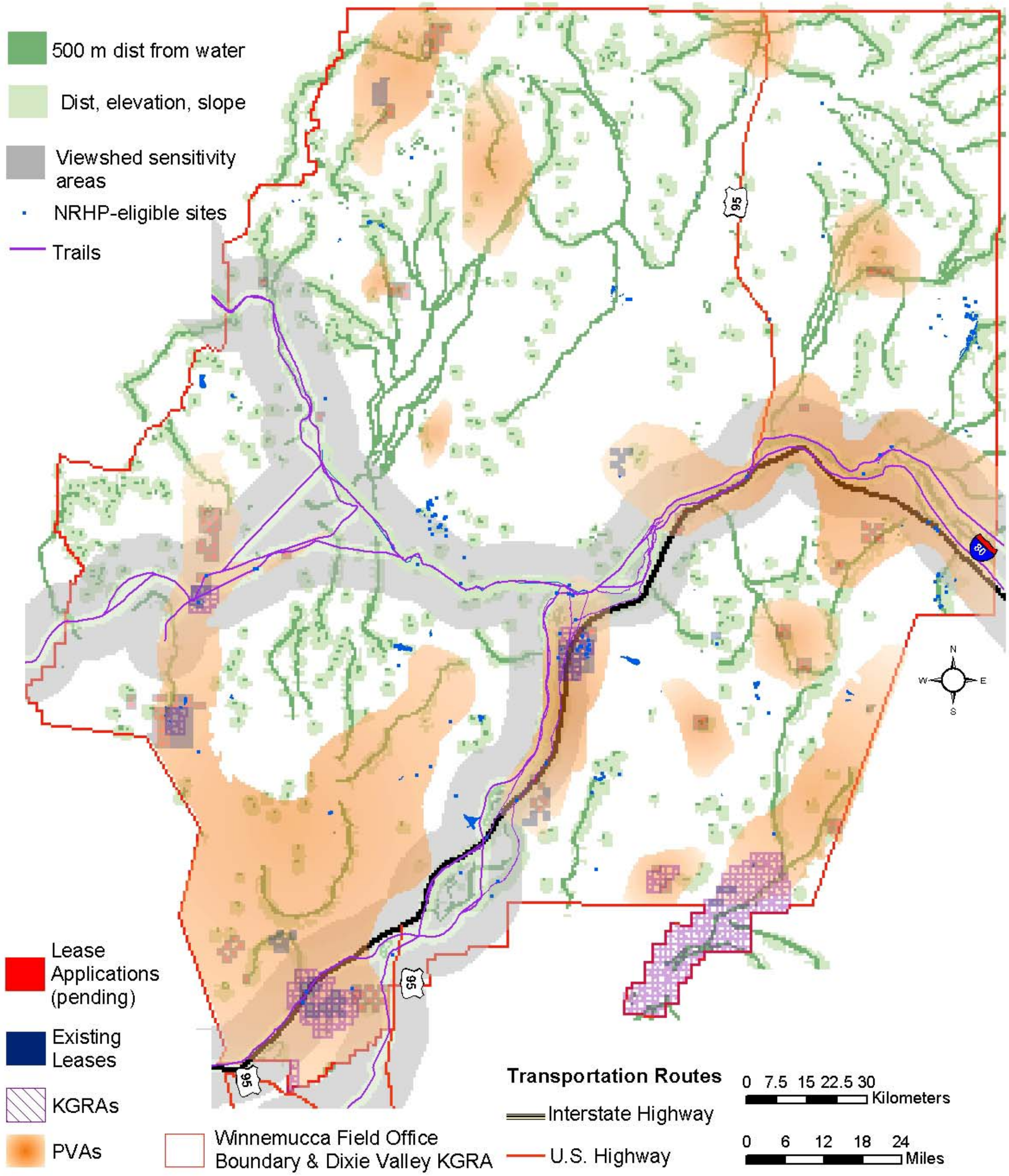


TABLE 3.15-2
PERCENT OF HIGH SENSITIVITY AREAS
FOR SIGNIFICANT CULTURAL RESOURCES

Region	Analysis Unit	H^2O 0-500 M	Elevation + Slope + H^2O	Viewshed	
				1 mile	5 miles
Northwest Region	PVA 1	10%	3%	-	-
	N Lease App	14%	3%	-	-
	S Lease App	10%	3%	-	-
	E Lease App	-	-	-	-
Black Rock Desert Region	PVA 2	5%	2%	-	-
	PVA 3	6%	2%	-	-
	Lease App	18%	62%	-	-
	PVA 4	2%	2%	-	-
	PVA 5	21%	7%	-	-
	Gerlach KGRA	2%	6%	75%	25%
	Lease App	6%	5%	13%	47%
	San Emidio KGRA	8%	1%	-	-
	Lease App	4%	4%	-	-
Humboldt River	PVA 6	11%	10%	-	-
	Lease App	75%	25%	-	-
	PVA 7	16%	3%	5%	75%
	N Lease App	-	-	-	100%
	S Lease App	15%	15%	-	-
	E Lease App	12%	1%	-	-
	W Lease App	12%	12%	-	100%
	PVA 8 Lease App near Brady KGRA	2%	9%	2%	98%
	PVA 9	12%	2%	35%	65%
	Rye Patch KGRA	13%	2%	70%	30%
	Lease App	6%	3%	50%	50%
	PVA 11	6%	4%	-	-
	Lease App	37%	10%	-	-
West Central Region	PVA 8	4%	2%	2%	30%
	Brady KGRA	9%	4%	3%	95%

Region	Analysis Unit	H^2O 0-500 M	Elevation + Slope + H^2O	Viewshed	
				1 mile	5 miles
	Lease App	14%	10%	-	-
	Hazen KGRA	-	-	-	20%
Truckee River	PVA 8 Lease App	-	1%	-	-
Central Region	PVA 10	1%	3%	-	-
	Lease App	6%	60%	-	-
	PVA 12	4%	4%	-	-
	NY Canyon KGRA	-	2%	-	-
	N Lease App	-	-	-	-
	S Lease App	-	-	-	-
	PVA 13	3%	2%	-	-
	Dix Valley KGRA	15%	1%	-	-
	N Lease App	12%	32%	-	-
	S Lease App	-	12%	-	-

3.15.2 Environmental Impacts

3.15.2.1 Proposed Action

Direct Impacts – There would be no direct impacts as a result of the proposed action.

Indirect Impacts – Most impacts to cultural resources under the "reasonably foreseeable development scenario" would be prevented through the Section 106 process of the National Historic Preservation Act[24] and no surface occupancy stipulations for National Register listed and National Register eligible sites. The following are indirect impacts that could occur under this scenario:

Exploration. Repeated off-road traffic along seismic lines creates roads and could inadvertently open access to previously inaccessible areas that could result in unauthorized collecting/excavation. New access roads to wells could also lead to increased accessibility of new areas to vandalism and illegal collecting/excavation. There could be minor impacts to the integrity of setting of the California Trail, Central Pacific Railroad, and other National Register listed/eligible sites where integrity of setting is critical to their listing/eligibility.

Development. Impacts to the integrity of setting of the California Trail, the Central Pacific Railroad, and other National Register listed/eligible sites where integrity of setting is critical to

[24] Natural Historic Preservation Act of 1966 (P.L. 890655 (16 USC §470; 36 CFR §§79 and 800))

their listing/eligibility could occur from construction of roads, drill site development, geothermal pipelines, power plants, and electric transmission lines. Roads could increase the likelihood of vandalism and illegal collecting/excavation of cultural sites.

Production. Most, if not all impacts to cultural resources would have occurred prior to the production phase. Very few changes affecting cultural resources would occur during this scenario phase.

Close-Out. If reclamation is complete, impacts to setting of cultural sites and impacts from increased accessibility which occurred under previous phases would be mitigated. Otherwise, these impacts would continue.

3.15.2.2 No Action Alternative

Direct Impacts – There are no direct impacts from issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.16 NATIVE AMERICAN CONSULTATION

According to the available documented evidence, the Native American peoples known to have traditionally occupied or used the area encompassed by the WFO District include the Northern Paiutes and Western Shoshones. For this project, the present-day tribes listed in Table 3.16-1 represent these groups. Representatives from these tribes and organizations were contacted for comment and input into this project. At its request, the Washoe tribe was also included in the tribes contacted.

TABLE 3.16-1
NATIVE AMERICAN TRIBES CONTACTED
FOR THE WINNEMUCCA GEOTHERMAL PROJECT

Alturas Indian Rancheria	Klamath Tribe
Battle Mountain Band	Lovelock Paiute Tribe
Burns Paiute Tribe	Pit River Tribe
Cedarville Rancheria	Pyramid Lake Paiute
Confederated Tribes of the Warm Springs Reservation	Shoshone-Bannock Tribes
Duck Valley Shoshone-Paiute Tribe	Summit Lake Paiute Tribe
Fallon Paiute-Shoshone Tribe	Susanville Indian Rancheria
Fort Bidwell Indian Community	Walker River Paiute Tribe
Fort McDermitt Tribe	Washoe Tribe
Inter-Tribal Council of Nevada	Winnemucca Tribe

3.16.1 Affected Environment

Geothermal resources (seeps, hot springs, and ponds) have long been an integral part of Native American medicinal, social, and spiritual activities within northern Nevada. As part of this assessment, the BLM entered into government-to-government consultation with 19 Native American tribes and 1 tribal organization to address their concerns with potential commercial geothermal resources research and development leasing. Consultation actions and results of this consultation are published in a separate report, developed in direct support of this PEA: *Summary Report of Native American Consultation Efforts for the Winnemucca Geothermal Project, August 2002.*

Seven of the consulted tribes (Lovelock Paiute, Pyramid Lake Paiute, Walker River Paiute, Washoe, and Fort McDermitt tribes, and the Alturas and Susanville Indian rancherias) and the Intertribal Council of Nevada (ITCN) responded to the BLM's request for information. Four of the tribes (Lovelock Paiute, Pyramid Lake Paiute, Walker River Paiute, and Washoe tribes) offered comments and concerns regarding the project. Three tribes (Alturas Indian rancheria, Susanville Indian rancheria, and Fort McDermitt tribe) and the ITCN responded that they have no further concerns regarding the project. The remaining 11 tribes did not respond to the BLM's request for information. The Lovelock and Pyramid Lake Paiute tribes both expressed concerns about natural hot springs within the assessment area. The Lovelock Paiute tribe's concerns also involve protection or treatment of artifacts and burials in the immediate vicinity of the hot springs areas.

An archival and literature review of ethnographic and ethnohistoric studies pertinent to the study area revealed 13 Native American culturally significant areas in or near the assessment area (see Table 3.16-2). As a result of BLM's consultation with affected Native American tribes and organization, one of the tribes identified Kyle Hot Springs (also listed in Table 3.16-2) as a culturally sensitive area within the assessment area. In general, other consultation efforts and ethnographies document the importance of hot springs to the Native American tribes in this area (ITS/Charis, 2002).

The Stillwater Range has also been identified as a culturally significant area by the Lovelock Paiute tribe, the Fallon Paiute tribe, and other Paiute tribes (McGuckian, 1996) because of traditional pine-nutting uses. The Lovelock Paiute trail to the pine nut area in the Stillwater Range is within the assessment area. In consultation with the State Historic Preservation Office (SHPO), the BLM is currently in the process of evaluating several areas in the vicinity of the Stillwater Range for National Register eligibility as Traditional Cultural Properties (TCPs). Although not yet formally determined, the following areas are considered eligible to the National Register of Historic Places: Cornish Canyon, New York Canyon, Hughes Canyon, Sheep Canyon, Fencemaker Pass, Table Mountain, and Red Hill. The trail to the pine nut area from Lovelock to the Stillwater Range also could be eligible. The Lovelock Paiute tribe, as well as other tribes, has traditionally used these areas for pine nut harvesting and they regard them as having great cultural and sacred importance. Integrity of setting is an important component of the eligibility of these areas.

TABLE 3.16-2
CULTURALLY SIGNIFICANT AREAS IDENTIFIED DURING ARCHIVAL/LITERATURE REVIEW

Name	Description
Burial Site of Joe Paul	Gravesite of the first white man to be buried in Nevada. Purportedly a landmark for the Northern Paiutes (Scott, 1966:8).
Chocolate Butte	Source of specularite, a mineral used for medicinal purposes by the Northern Paiutes (McGuckian, 1996:151).
Cinnabar Hill (Red Hill)	Called *Tatóiya* (translation unknown) by the Northern Paiutes. Area was utilized for pine-nutting. It was avoided at night possibly because of its association with an incident involving Western Shoshones who tried to use the cinnabar as ochre, decorating their bodies in Northern Paiutes fashion. Some of these people died as a result, possibly due to mercury poisoning from the cinnabar (McGuckian, 1996:108-9; Scott, 1966:137).

Name	Description
Dixie Hot Springs	Called *Paumag^{w}aitu* by the Northern Paiute. Important to the Fallon Paiute-Shoshone tribe for spiritual and medicinal purposes, particularly because of the curative properties of the hot water and mud. (Facilitators, Inc., 1980:2.67; Fowler, 1992:178).
Granite Point	Called *Tohatekatupogi* (white rock sticking out cave) by the Northern Paiutes. Small cave (Site 26Pe9) located in a rock formation known as Granite Point (Grosscup, 1974:16).
Kyle Hot Springs	Important to the Lovelock Paiutes for medicinal, social, and spiritual purposes (Facilitators Inc., 1980:2.9; Smith et al., 1983:169).
Limerick Canyon Springs	Important to Lovelock Paiutes for medicinal, social, and spiritual purposes (Facilitators Inc., 1980:2.9-10, 2.17; Smith et al., :169).
Squaw Butte	May have been used for vision questing and may also be an eagle nesting area (Woods Cultural Research. Inc., 1997:46).
Stillwater Range	Important to the Northern Paiutes as a major pine-nutting area, as well as an important area for collecting plants and hunting (Facilitators 1980:2.66; Fowler, 1992:39; Hopkins, 1994:64; Loud and Harrington, 1929:152, 158; McGuckian, 1996:99; Scott, 1966:7; Shimkin and Reid, 1970).
Trail – Stillwater Range	Trail used by the Lovelock Paiute Tribe to access pine-nutting areas in the Stillwater Range (McGuckian, 2002).
Two Tips	Called *waha-kutakwA* (two tips). Favored woodchuck-hunting area to the Northern Paiutes (Loud and Harrington, 1929:154).
Where the Animals Were Kept	Cave called *Tu-wi'-hu ta-wa'-gun* or *Ta-vu-to-o* (translation unknown) by the Northern Paiutes. Associated with Northern Paiute story about Wolf and Coyote (Fowler and Fowler, 1971:225-6, 241-2, 249, 288; Kelly, 1938:378; Steward, 1943:298).
Winnemucca Lake	Called *izikuyuipanün∂d* (translation unknown) by the Northern Paiutes. At one time, was known to be the home of a mean water baby and a great green snake (Fowler, 1989:9; Fowler and Fowler, 1971: 286; Stewart, 1941:444).

3.16.2 Environmental Impacts

3.16.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – The following are the potential environmental impacts on Native American consultation when analyzing the "reasonably foreseeable development scenario."

Exploration. Geothermal exploration in the New York Canyon KGRA, PVA 12, and the north and south leases in PVA 12 could impact TCPs in the Stillwater Range. The setting of these TCPs could also be impacted. Similarly, other areas that have been identified as culturally significant to Native Americans in the affected environment (see Table 3.16-2), or that are identified through subsequent consultation efforts, could be impacted if they are in or near assessment areas. Access road and well construction could destroy all or portions of TCPs and other culturally significant areas and/or impair their setting. Access roads or roads created from repeated off-road travel along seismic lines could lead to increased use and impairment or destruction of culturally significant areas by non-Native Americans.

If the flow or temperature of hot springs is affected by geothermal drilling, hot springs, which are considered sacred by Native Americans, could be impacted. The springs could dry up or become cooler in temperature. Since the thermal water in these springs is considered sacred, this would result in a loss of these sacred sites, and the healing energy and power they provide to the Native Americans who value them.

Prior to approving a lease for geothermal energy exploration on any lands within the WFO boundaries, the BLM would require the commercial entity to produce a site-specific EA, part of which would address Native American concerns for the specific lease area. At that time, affected Native American tribes would have another opportunity to express concerns and offer alternatives and/or mitigating measures to the proposed exploration. To ensure Native American concerns are addressed and impacts avoided, stipulations have been developed (see Appendix G).

Development. Impacts to areas of Native American concern during the developmental phase would be more extensive, long lasting, and severe. Geothermal development in the New York Canyon KGRA, PVA 12, and the north and south leases in PVA 12 could impact TCPs in the Stillwater Range. The setting of these TCPs could also be impacted. Similarly, other areas that have been identified as culturally significant to Native Americans could be impacted if they are in or near assessment areas. Construction of roads, drill site development, pipelines, power plants, and electric transmission lines could destroy all or portions of TCRs and other culturally significant areas and/or impair their setting. This could result in a permanent loss of areas that are considered sacred and/or important to Native American heritage and the maintenance of their culture.

If the flow or temperature of hot springs is affected by geothermal drill site development and/or production, hot springs, which are considered sacred by Native Americans, could be impacted. The springs could dry up or become cooler in temperature. Since the thermal water in these springs is considered sacred, this would result in a loss of these sacred sites, and the healing energy and power they provide to the Native Americans who value them.

Prior to approving a lease for geothermal energy development on any lands within the WFO boundaries, the BLM would require the commercial entity to produce a site-specific EA, part of which would address Native American concerns for the specific lease area. At that time, affected Native American tribes would have another opportunity to express concerns and offer alternatives and/or mitigating measures to the proposed exploration. To ensure Native American concerns are addressed and impacts avoided, stipulations have been developed (see Appendix G).

Production. Assuming that Native American concerns were mitigated during the development phase of geothermal energy leasing, there should be no additional impacts that would affect the production phase.

Close-Out. During the close-out phase for geothermal energy development, the commercial entity would be required to remove all production, transmission, and support facilities and return the affected area to its natural condition. If Native American consultations are deemed necessary, the BLM would again enter into government-to-government consultations to ensure Native American interest and concerns are addressed.

3.16.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

[25] U.S. Department of the Interior, Bureau of Land Management. Sonoma-Gerlach and Paradise-Denio Management Framework Revised Plan Amendment and Draft EIS. August 2000 (unpublished).

3.17 HAZARDOUS MATERIALS/WASTE AND SOLID WASTE

For purposes of this section, we are concerned with *hazardous materials*, *hazardous substances*, *hazardous waste*, and *solid waste*. *Hazardous materials* is the most generic and inclusive term. It has been defined as any substance that, due to quantity, concentration, physical, chemical, or infectious characteristic, may present substantial danger to public health, welfare, or the environment when released. The term includes *hazardous substances* and *hazardous waste*. Examples of hazardous materials include petroleum, natural gas, synthetic gas, toxic chemicals, and low-level radioactive sources.

Hazardous substances are identified and regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).[26] *Hazardous substances* as defined in 40 CFR §373.4 refer to the group of substances defined as hazardous under CERCLA 101(14), and appear in the reference's Table 302.4. The elements, compounds, and hazardous wastes appearing in Table 302.4 are designated as *listed hazardous substances* under section 102(a) of CERCLA. *Hazardous substances* also include unlisted solid wastes that exhibit characteristics of ignitability, corrosivity, reactivity, or toxicity. The term *hazardous substance* does not include petroleum, crude oil, or are fraction of crude oil unless it is specifically listed or designated, and the term does not include natural gas or synthetic gas useable as fuel (40 CFR 300.5).

Hazardous wastes are identified and regulated under the Resource Conservation and Recovery Act (RCRA).[27] Hazardous wastes are defined as solid wastes that exhibit one or more of the characteristics of ignitability, corrosivity, toxicity, or reactivity, or are listed as a hazardous waste in 40 CFR Part 261 Subpart D. *Solid wastes* that are not hazardous by the RCRA definition, normally referred to simply as "solid wastes," are basically any relatively benign materials that are discarded. Solid wastes can include domestic or industrial refuse, vegetative debris from land clearing, discarded construction materials, drill cuttings, and some of the materials used for drilling and plugging wells. Sewage sludge is not a solid waste.

3.17.1 Affected Environment

Hazardous materials, hazardous waste, and solid waste are not normally considered to be part of the natural environment. These items are, rather, the result of human intrusion into the natural environment. In this PEA is concerned only with hazardous materials, hazardous waste, and solid waste used or generated by exploration and development activities resulting from leasing under the Proposed Action.

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[26] Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (P.L. 96-510) as amended by the Superfund Amendments and Reauthorization Act (SARA) Title III of 1986 (P.L. 99-499) and the Community Environmental Response Facilitation Act of 1992 (P.L. 102-426)

[27] Resource Conservation and Recovery Act (RCRA) of 1976 (P.L. 94-580 (42 USC §6901))

3.17.2 Environmental Impacts

3.17.2.1 Proposed Action

Direct Impacts – There are no direct impacts from issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – When considering the "reasonably foreseeable development scenario," impacts would be insignificant if the substances described in section 3.17.2 are properly handled, stored, and disposed. Proper management of these substances according to Federal and State regulations would ensure that no soil, groundwater, or surface water contamination would occur with any adverse effects on wildlife, worker health and safety, or surrounding communities. Proper management (in accordance with Federal (RCRA, SARA,[28] SWDA,[29] OSHA,[30] EPCRA,[31] etc.) and State regulations) of these substances would ensure no contamination of soil, groundwater, and surface water, which could also have an impact on wildlife, worker health and safety, and the surrounding community. Under this alternative this updated PEA would permit inclusion of updated stipulations, mitigation measures, and/or performance standards specific to each lease that would ensure the long-term health of the area's environmental quality.

The following are environmental impacts from hazardous materials, hazardous waste, and solid waste, which might be encountered in the "reasonably foreseeable development scenarios.

Exploration. Impacts could include drilling fluid or hydrocarbon spills, leakage from improperly constructed sump pond or wastewater collection systems, improperly handled briny water from drilling, and accumulations of solid waste which could impact water quality or contaminate soils. Hydrocarbon spills could be hydraulic fluid, gasoline, oil, or grease from vehicles, generators, and exploratory drill rigs. Briny water from exploratory drilling, if improperly disposed, could raise the pH of existing surface waters to hazardous levels. Accumulations of non-hazardous waste solids and liquids could include trash, drill cuttings, wastewater, bentonite, and cement generated during drilling operations.

Development. Impacts would be the same as in the exploration phase, but the quantities of hazardous materials, hazardous waste, or solid waste used and generated could be greater. In addition, stormwater runoff could contain elevated quantities of heavy metals and volatile organic compounds. Substantial quantities of non-hazardous solid waste and liquids could be generated at this stage, increasing the potential for contamination of water, soil, and possible toxic impacts to wildlife.

Production. Impacts of the long-term production phase could include spills and leaks from routine plant operations. Some of the involved materials could be hydraulic fluid, gasoline, oil,

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[28] Superfund Amendments and Reauthorization Act (SARA) of 1986
[29] Solid Waste Disposal Act (SWDA) of 1965 (P.L. 89-272m Title II, as amended by P.L. 94-580)
[30] Occupational Safety and Health Act (OSHA) of 1970 (P.L. 91-596, as amended; 29 CFR §1926.58)
[31] Emergency Planning and Community Right to Know Act (EPCRA) of 1986 (42 USC Chapter 116, §11001 *et seq.*)

paint, antifreeze, cleaning solvents, transformer insulating fluid, binary fluids, and grease; these discharges could result in adverse impacts to water, soil, air, and wildlife. Accidental releases from sumps or wastewater collection systems could include hazardous water-treatment chemicals such as chlorine. Stormwater runoff containing excess heavy metals and volatile organic compounds could be a problem. There would likely be substantial quantities of non-hazardous solid waste generated.

Binary geothermal operations could use hazardous materials that are highly explosive and could have impacts to public safety, and increase the potential for wild fires.

Close-Out. Site personnel would identify, remove, and properly dispose all hazardous materials, hazardous waste, and solid waste. Spills could occur during the removal operation.

Based on meeting regulatory requirements and implementing leasing stipulations, adverse impacts from hazardous materials would be minor.

3.17.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

3.18 SOCIO-ECONOMICS

3.18.1 Affected Environment

The assessment area encompasses seven hydrographic basins or regions and is located within portions of Humboldt, Pershing, Washoe, and Churchill counties. Humboldt County contains six PVAs. Pershing County contains two KGRAs and five PVAs. Washoe and Churchill Counties contain two KGRAs each. One KGRA and two PVAs span a portion of more than one county. Multiple pending lease application sites are located in all four counties. The potential exists for each of these counties to experience socio-economic effects as a result of geothermal leasing. The principal economic activities conducted on these resource lands are recreation, agriculture, and mining.[32]

3.18.1.1 Humboldt County

Portions of hydrographic regions within the assessment area that are located in Humboldt County include the Northwest Region (1), the Black Rock Region (2), the Humboldt River Basin (4), and the Central Region (10). Humboldt County is the fourth largest of 17 counties in the state of Nevada, encompassing a total area of approximately 9,700 square miles. The county is rural and sparsely populated. The 2000 estimated population for Humboldt County was 18,149 with a population density of 1.87 persons per square mile.[33] Winnemucca, the only incorporated city in the county, had a 2000 population estimate of 8,884 constituting nearly half of the county's population.[34]

The Federal government represents a significant presence in the county. Almost 80 percent of the county's 6,210,560 acres (4,964,568 acres) are under Federal ownership. Federal Payments in Lieu of Taxes to the county in fiscal year 2002 amounted to approximately $750,000.

The total personal income reported for Humboldt County in 2000 was nearly $410 million.[35] Total personal income includes earnings by work place, personal contributions for social insurance, adjustments for residence, dividends, interest, rent, and transfer payments. Earnings by work place were estimated at $323.6 million, which represented nearly 80 percent of the total income for the county. Table 3.18.1 shows earnings by work place and employment by major industrial sectors for Humboldt County in 2000. Per capita personal income for Humboldt County was estimated at $25,665 in 2000. This per capita personal income ranked fifth in the state making up approximately 87 percent of the state average of $29,506 and 87 percent of the national average of $29,469.

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32 U.S. Department of the Interior, Bureau of Land Management. Sonoma-Gerlach and Paradise-Denio Management Framework Revised Plan Amendment and Draft EIS. August 2000 (unpublished).
33 Nevada State Demographer's Office. Nevada County Population Estimates July 1, 1986 to July 1, 2000. February 27, 2001.
34 U.S. Department of the Interior, Bureau of Land Management. Sonoma-Gerlach and Paradise-Denio Management Framework Revised Plan Amendment and Draft EIS. August 2000 (unpublished).
35 Ibid.

Total employment for Humboldt County in 2000 was estimated at 9,836 jobs. The mining industry was the largest income producer generating $93.4 million in income. The mining industry made up nearly 30 percent of the income and 15 percent of employment in Humboldt County. The services industry was the largest employer, making up 22.5 percent of employment but only 13.3 percent of income.[36]

Humboldt County unemployment was reported for the fourth quarter of 2001 at 350 persons, for an unemployment rate of 5.1 percent. This compares with data for the fourth quarter of 2000, which indicates 340 people unemployed and an unemployment rate of 4.6 percent.

TABLE 3.18.1
HUMBOLDT COUNTY EARNINGS AND EMPLOYMENT BY MAJOR INDUSTRY (2000)

Industrial Sector	Earnings		Employment	
	Total ($)	Percent of Total	Number of Jobs	Percent of Total
Agriculture	13,979,000	4.3	602	6.1
Agriculture Services	2,399,000	0.7	238	2.4
Mining	93,444,000	28.9	1,472	15.0
Construction	16,918,000	5.2	534	5.4
Manufacturing	12,771,000	3.9	347	3.5
Transportation and Public Utilities	34,860,000	10.8	655	6.7
Wholesale Trade	9,258,000	2.9	235	2.4
Retail Trade	30,613,000	9.5	1,687	17.2
Finance, Insurance, and Real Estate	7,020,000	2.2	437	4.4
Services	43,128,000	13.3	2,209	22.5
Government	59,199,000	18.3	1,420	14.4
Total	323,589,000	100.0	9,836	100.0

Note: Earnings include wages and salaries, other labor income, and proprietor income. Earnings represent the principal component of total income, which is comprised of adjustments for residence, dividends, interest, rent and transfer payments less personal contributions for social insurance.
Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, May 2002.

[36] Ibid.

3.18.1.2 Pershing County

Portions of hydrographic regions within the assessment area that are located in Pershing County include the Black Rock Region (2), the Humboldt River Basin (4), the West Central Region (5), the Truckee River Basin (6), the Carson River Basin (8), and the Central Region (10). Pershing County is the eighth largest county in the state, encompassing approximately 6,030 square miles. Pershing County, like Humboldt County, is rural and sparsely populated.[37] The estimated population for Pershing County in 2000 was 7,458 (Nevada State Demographer's Office 2001) with a population density of 1.2 persons per square mile.[38] Lovelock, the only incorporated city in Pershing County, had an estimated population of 2,772 making up 37 percent of the county's total population.

Much of the land within the county is public land managed by the Federal government. Approximately 76 percent of the county's 3,859,840 acres (2,929,129 million acres) are under Federal ownership. The public land includes 2,909,949 acres managed by the BLM and 19,180 acres administered by the Bureau of Reclamation. Federal Payments in Lieu of Taxes to the county in fiscal year 2002 amounted to approximately $489,000.

The total personal income reported for Pershing County in 2000 was nearly $112 million.[39] Total personal income includes earnings by work place, personal contributions for social insurance, adjustments for residence, dividends, interest, rent, and transfer payments. Earnings by work place were estimated at $83.2 million and represented 74 percent of the total income for the county. Table 3.18.2 shows earnings by work place and employment by major industrial sectors for Pershing County in 2000. Per capita personal income for the county was estimated at $16,810 in 2000. This per capita personal income ranked 17th or last in the state making up only 57 percent of the state and national average of $29,506 and $29,469, respectively.

Total employment for Pershing County in 2000 was estimated at 2,666 jobs. The mining industry was the largest income producer generating $34.7 million. The mining industry made up nearly 42 percent of the income and 25 percent of employment in Pershing County. Government was the second largest income producer generating $26.6 million and making up 25 percent of employment.

Pershing County unemployment was reported for the fourth quarter of 2001 at 90 persons, for an unemployment rate of 4.6 percent. This compares with data for the fourth quarter of 2000, which indicates 80 people unemployed and an unemployment rate of 3.8 percent.

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[37] Ibid.
[38] Nevada State Demographer's Office. Nevada County Population Estimates July 1, 1986 to July 1, 2000. February 27, 2001.
[39] U.S. Department of Commerce, Bureau of Economic Analysis. Regional Economic Information System. May 6, 2002.

TABLE 3.18.2
PERSHING COUNTY EARNINGS AND EMPLOYMENT
BY MAJOR INDUSTRY (2000)

Industrial Sector	Earnings		Employment	
	Total ($)	Percent of Total	Number of Jobs	Percent of Total
Agriculture	3,902,000	4.6	312	11.7
Agriculture Services	N/A*	N/A*	N/A*	N/A*
Mining	34,691,000	41.7	677	25.4
Construction	1,121,000	1.3	42	1.6
Manufacturing	1,419,000	1.7	65	2.4
Transportation and Public Utilities	4,233,000	5.1	59	2.2
Wholesale Trade	430,000	0.5	14	0.5
Retail Trade	6,013,000	7.2	406	15.2
Finance, Insurance, and Real Estate	N/A*	N/A*	N/A*	N/A*
Services	3,823,000	4.6	275	10.3
Government	26,595,000	32.0	678	25.4
Total	83,196,000	100.0	2,666	100.0

*Values not available – figures not provided in source to avoid disclosure of confidential information, however the estimates for this item were included in the totals.

Note: Earnings include wages and salaries, other labor income, and proprietor income. Earnings represent the principal component of total income, which is comprised of adjustments for residence, dividends, interest, rent and transfer payments less personal contributions for social insurance.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, May 2002.

3.18.1.3 Washoe County

Portions of hydrographic regions within the assessment area that are located in Washoe County include the Northwest Region (1), the Black Rock Region (2), the Humboldt River Basin (4), the West Central Region (5), the Truckee River Basin (6), and the Carson River Basin (8). Washoe County is the seventh largest of 17 counties in the state of Nevada, encompassing a total area of approximately 6,600 square miles. The majority of the county is rural and sparsely populated however a large portion of the population is concentrated in the southern part of the county in the cities of Reno and Sparks.[40] The 2000 estimated population for Washoe County was 333,566 with a population density of 50.5 persons per square mile. The incorporated cities of Reno and Sparks had a 2000 population estimate of 182,818 and 66,240, respectively, together constituting nearly 75 percent of the county's population.[41]

Approximately 70 percent of the county's 4,229,120 acres (approximately 2.9 million acres) are under Federal ownership. The BLM manages approximately 2.6 million acres; the USFWS, Forest Service, and Bureau of Reclamation manage the balance. Federal Payments in Lieu of Taxes to the county in fiscal year 2002 amounted to approximately $1.6 million, the highest in the state.

The total personal income reported for Washoe County in 2000 was nearly $11.9 billion.[42] Total personal income includes earnings by work place, personal contributions for social insurance, adjustments for residence, dividends, interest, rent, and transfer payments. Earnings by work place were estimated at $8.4 billion and represented 70 percent of the total personal income for the county. Table 3.18.3 shows earnings by work place and employment by major industrial sectors for Washoe County in 2000. Per capita personal income for the county was estimated at $34,879 in 2000. This per capita personal income ranked second in the state and was approximately $5,400 greater than the state and national average of $29,506 and $29,469, respectively.

Total employment for Washoe County in 2000 was estimated at 240,785 jobs. The services industry was the largest income producer generating nearly $3 billion constituting 35 percent of the total personal income for the county. The services industry was also the largest employer constituting nearly 39 percent of employment in Washoe County. Government was the second largest income producer generating nearly $1.2 billion in personal income. The retail industry was the second largest employer accounting for 15 percent of those employed in the county.

Washoe County unemployment was reported for the fourth quarter of 2001 at approximately 8,700 persons, for an unemployment rate of 4.6 percent. This compares with data for the fourth quarter of 2000, which indicates approximately 5,000 people unemployed and an unemployment rate of 3.1 percent.

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[40] U.S. Department of the Interior, Bureau of Land Management. Sonoma-Gerlach and Paradise-Denio Management Framework Revised Plan Amendment and Draft EIS. August 2000 (unpublished).

[41] Nevada State Demographer's Office. Nevada County Population Estimates July 1, 1986 to July 1, 2000. February 27, 2001.

[42] U.S. Department of Commerce, Bureau of Economic Analysis. Regional Economic Information System. May 6, 2002.

TABLE 3.18.3
WASHOE COUNTY EARNINGS AND EMPLOYMENT
BY MAJOR INDUSTRY (2000)

Industrial Sector	Earnings		Employment	
	Total ($)	Percent of Total	Number of Jobs	Percent of Total
Agriculture	8,409,000	0.1	689	0.3
Agriculture Services	41,498,000	0.5	2,166	0.9
Mining	48,047,000	0.6	953	0.4
Construction	763,538,000	9.1	17,607	7.3
Manufacturing	675,277,000	8.0	14,870	6.2
Transportation and Public Utilities	603,810,000	7.2	13,664	5.7
Wholesale Trade	612,214,000	7.3	13,620	5.7
Retail Trade	802,718,000	9.5	36,928	15.3
Finance, Insurance, and Real Estate	741,483,000	8.8	24,212	10.1
Services	2,969,501,000	35.2	93,459	38.8
Government	1,164,634,000	13.8	22,617	9.4
Total	8,431,129,000	100.0	240,785	100.0

Note: Earnings include wages and salaries, other labor income, and proprietor income. Earnings represent the principal component of total income, which is comprised of adjustments for residence, dividends, interest, rent and transfer payments less personal contributions for social insurance.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, May 2002.

3.18.1.4 Churchill County

The Dixie Valley KGRA, located in Churchill County, lies within the Central Hydrographic Region (10). Churchill County encompasses approximately 3,013 square miles. The estimated population for Churchill County in 2000 was 26,247 with a population density of 8.7 persons per square mile.[43] Fallon, the only incorporated city in Churchill County, had an estimated population of 8,386 making up nearly 32 percent of the county's total population.

[43] Nevada State Demographer's Office. Nevada County Population Estimates July 1, 1986 to July 1, 2000. February 27, 2001.

TABLE 3.18.4
CHURCHILL COUNTY EARNINGS AND EMPLOYMENT
BY MAJOR INDUSTRY (2000)

Industrial Sector	Earnings		Employment	
	Total ($)	Percent of Total	Number of Jobs	Percent of Total
Agriculture	6,979,000	1.8	659	4.9
Agriculture Services	N/A*	N/A*	N/A*	N/A*
Mining	770,000	0.2	60	0.4
Construction	34,943,000	8.9	757	5.6
Manufacturing	21,539,000	5.5	709	5.2
Transportation and Public Utilities	N/A*	N/A*	N/A*	N/A*
Wholesale Trade	7,421,000	1.9	330	2.4
Retail Trade	37,500,000	9.6	2,111	15.5
Finance, Insurance, and Real Estate	17,133,000	4.4	1,354	10.0
Services	104,459,000	26.7	3,996	29.4
Government	141,306,000	36.1	3,073	22.6
Total	567,304,000	100.0	13,576	100.0

*Values not available – figures not provided in source to avoid disclosure of confidential information, however the estimates for this item were included in the totals.

Note: Earnings include wages and salaries, other labor income, and proprietor income. Earnings represent the principal component of total income, which is comprised of adjustments for residence, dividends, interest, rent and transfer payments less personal contributions for social insurance.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, May 2002.

The total personal income reported for Churchill County in 2000 was approximately $567 million. Total personal income includes earnings by work place, personal contributions for social insurance, adjustments for residence, dividends, interest, rent, and transfer payments. Earnings by work place were estimated at $391.2 million, representing nearly 70 percent of the total income for the county. Table 3.18.4 shows earnings by work place and employment by major industrial sectors for Churchill County in 2000. Per capita personal income for Churchill County was estimated at $23,615 in 2000. This per capita personal income ranked 11th in the state making up approximately 80 percent of the state average of $29,506 and 80 percent of the national average of $29,469.[44]

Approximately 71 percent of the county's 3,020,588 acres (2,143,755 million acres) are under Federal ownership. Federal Payments in Lieu of Taxes to the county in fiscal year 2002 amounted to approximately $1 million.

Total employment for Churchill County in 2000 was estimated at 13,576 jobs. The government was the largest income producer generating $141 million in income. The government made up 36 percent of the income and nearly 23 percent of employment in Churchill County. The services industry was the largest employer, making up nearly 30 percent of employment and nearly 27 percent of income.

Churchill County unemployment was reported for the fourth quarter of 2001 at 630 persons, for an unemployment rate of 7 percent. This compares with data for the fourth quarter of 2000, which indicates 690 people unemployed and an unemployment rate of 7.6 percent.

3.18.2 Environmental Impacts

3.18.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Future geothermal exploration, development, production, and close-out activities in the "reasonable foreseeable development scenario" could be seen to provide moderately beneficial impacts to the county economies in the terms of jobs, income, and tax revenues. No adverse impacts are identified.

The following are the potential environmental impacts on social and economics when analyzing the "reasonably foreseeable development scenario."

Exploration. The social and economic impacts in the exploration phase are expected to be minimal. We expect that the geothermal companies doing exploration would bring their in-house exploration scientists and technicians to do the majority of this work. After initial surveys have been completed, road building and drill pad construction could occur in order to drill temperature gradient and exploration wells. Road and drill pad construction work could be contracted out to local contractors. Some minor positive impacts could also be realized from rental of hotel rooms, meals, purchase of supplies. Employment opportunities for the local workforce are expected to be minimal during this phase.

[44] U.S. Department of Commerce, Bureau of Economic Analysis. Regional Economic Information System. May 6, 2002.

[45] U.S. Department of the Interior, Bureau of Land Management. Sonoma-Gerlach and Paradise-Denio Management Framework Revised Plan Amendment and Draft EIS. August 2000 (unpublished).

Development. Positive social and economic impacts would be greater during the development phase. During this phase, more permanent roads and drill pads would be constructed, geothermal pipelines would be laid, power plant and/or direct-use and miscellaneous support facilities would be constructed, and electric transmission lines and substations would be constructed. Geothermal companies are expected to contract out much of this work to local contractors and builders. Purchase of supplies and construction materials could also benefit local merchants. Transporting of supplies and building materials could also benefit local trucking and delivery companies. Some minor positive impacts could also be realized from hotel room rentals and meals purchases. Employment opportunities for the local workforce are expected greater than during the exploration phase; however, most of the employment opportunities are expected to be short-term/part-time.

Production. During this phase, major construction would be complete and the power plant would be producing electrical power. The geothermal company could hire several technicians and laborers to monitor power production and keep the plant operating. The positive social and economic impacts during this phase would result from the sale of electrical power and the taxes generated as a result of those sales. Each plant facility would be required to pay sales, use, and property taxes, net proceeds from mine taxes, and royalties to the Federal government which would be shared with the State. Full-time/long-term employment opportunities for the local workforce during this phase would probably to be minimal.

Close-Out. During the close-out phase, electrical power generation would terminate and the site would be abandoned. As part of the close-out phase, surface equipment and buildings would be removed, electrical transmission lines would be removed, wells would be capped and cemented closed, and surface disturbance would be re-graded, seeded, and returned to its original condition or reclaimed to BLM's satisfaction. Geothermal companies are expected to contract out much of this dismantling, re-grading, and reclamation work to local contractors. Purchase of supplies and dismantling materials could also benefit local merchants. Transporting of supplies and discarded building materials could also benefit local trucking and delivery companies. Some minor positive impacts could also be realized from hotel room rentals and meals purchases. Employment opportunities for the local workforce are expected to be similar to the development phase; however, most of the employment opportunities would probably be short-term/part-time.

3.18.2.2 No Action Alternative

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

[46] Ibid.
[47] Ibid.
[48] Ibid.

3.19 ENVIRONMENTAL JUSTICE

3.19.1 Affected Environment

Proposed leasing activities are located in remote, unpopulated portions of public lands away from minority and/or low-income populations.

3.19.2 Environmental Impacts

Proposed leasing activities would have no adverse impacts on human health or environments of minority and/or low-income populations under either the Proposed Action or No Action Alternative.

3.20 PALEONTOLOGY

3.20.1 Affected Environment

The assessment area is located in the northwest corner of the Great Basin portion of the Basin and Range physiographic province of the western United States. The north trending mountain ranges and intervening valleys are, in part, composed of rock and sediments (consolidated and unconsolidated) that contain fossils of plants and animals.

No systemic field survey has been conducted for paleontological resources in the WFO or the assessment area. In 1978, BLM contracted paleontologist David Lawler (Lawler, 1978; Lawler and Roney, 1978) to review literature, summarize previously known paleontological resources, and analyze the potential for unknown resources in the WFO. Since then, independent researches have identified numerous paleontological localities within the WFO boundaries. Some localities are located in and near the assessment area. Many of the sedimentary units that lie within the assessment area are potential localities for occurrences of fossils.

The assessment area also includes several sources of paleoenvironmental information. These include fossil pollen localities, ancient woodrat middens, and quarternary sedimentary shoreline features/deposits related to Lake Lahontan history. Areas that have been continuously wet through time (e.g., springs and meadows) or, conversely, areas that have been continuously dry (e.g., dry caves or woodrat middens) are most likely to preserve fossil pollen record. Woodrat middens are found in dry caves and on cliff faces. Volcanic ashes are also important stratigraphic and chronological markers. Trego Hot Springs area contains an important ash layer. Streams also have the potential to yield valuable information on changing stream flow and erosion through time. Information on fluctuations of Pleistocene Lake Lahontan is provided in wave-cut terraces, gravel bars, beaches, and tufa deposits.

Note: The discussions are taken from Lawler, 1978; Lawler and Roney, 1978; Jefferson et al., (no date); and Firby, 1983 unless otherwise referenced.

Northwest Region. The geologic units in this region likely to contain fossils are volcaniclastic and tuffaceous sediments of Virgin Valley Formation of Miocene age and the tuffaceous sediments, sands, and ashes of the Thousand Creek Formation of Pliocene age. Both of these formations have yielded fossils outside of the assessment area. These formations do occur within the PVA 1 so there is a high likelihood that fossils may occur there. One of the recorded sites occurs within PVA 1 north of McGee Mountain. The others are located west and north outside PVA 1. The Virgin Valley Formation has yielded rich mammalian fauna, turtles, mountain beavers, camel, mastodon, large cats, dogs, raccoon, hare, horse, rhino, pig, deer, pronghorn, large conifer trees, rushes, and willows. The Thousand Creek Formation has yielded the most complete mammalian fauna in Nevada. The deposit has yielded remains of various species of snake, goose, moles, bear, mastodon, rhino, camel, large cats, dog, squirrel, beaver, pocket gopher, rats, mice, voles, hare, kangaroo rat, pocket mice, pig, and pronghorn.

Black Rock Desert Region. This region contains a variety of geologic units that are known to contain fossils. A small outcrop of Permian age limestone at the south end of the Bilk Creek Mountains includes a richly fossiliferous zone with corals, bryozoa, fusulinids, echinoids, brachiopods, and gastropods. This outcrop is located east of PVA 2. These similar rocks occur within PVA 2 at the north end of the Jackson Mountains and on the east side of the Pine Forest Range. In fact, corals, mollusks, and crinoids of Triassic age have been identified from the eastern slopes of the Pine Forest Range, within PVA 2. The recovery of marine Triassic and Jurassic fossils is anticipated in the Krum Hills, Blue Mountain, and Eugene Mountains. These are all located close to PVA 7. Gastropods, pelecypods, ostracods, and algal stromatolites occur in the King Lear Formation in the Jackson Mountains. PVA 4 is located immediately east of the area. Miocene diatomaceous deposits that include a number of diatom species have been found in the Jackson Range. Petrified wood has been found in the southeastern Pine Forest Range within or very close to PVA 2. Unidentified Miocene age fossils have been reported in the McDermitt area in PVA 5. Pliocene age fossil vertebrates and plants have been reported in abundance from the Rabbithole area. This site is located outside the assessment area; however, PVA 8 and PVA 4 may have similar rocks. A late Tertiary deposit in the Spring Creek in PVA 6 area contains freshwater fish and plant remains (willow, oak, and elm). A five-foot thick layer of strata composed entirely of fresh water gastropods has been reported from the Black Rock Desert east of PVA 4. Several sites yielding Pleistocene mammoths and associated fauna have been recorded in the east arm of the Black Rock Desert near PVAs 2 and 4. Lease applications NVN07300 and NVN07301 located at Pinto Hot Springs are close to one of these sites. Associated fossils include wolf, horse, camel, sabor tooth, ducks, geese, rabbit, mice, rats, deer, and bison. A rock shelter located seven miles south of PVA 4 has yielded Holocene age lizard, ground squirrel, coyote, and bighorn sheep. A late Holocene site at Trego Hot Springs near PVA 8 has yielded a large assemblage of vertebrate fossils including lizards, birds, ground squirrel, lynx, coyote, bison, bighorn sheep, rabbit, rats, and snakes.

Humboldt River Region. Geologic units present in this region range in age from early Paleozoic to Late Quaternary (Recent) in age. The likelihood of discovering fossils in many of the formations known to contain fossils is high. The Cambrian Preble Formation in the Osgood Mountains, in PVA 7, contains brachiopods, snails, tentaculities, and trilobites. The Cambrian Harmony Formation in the Osgood Mountains and Hot Springs Range contains trilobites in close proximity to PVAs 6 and 7. The Ordovician Comus and Valmy Formations in the Osgood Mountains and in the Antler Peak areas have yielded graptolites and trilobites in PVA 7. Late Paleozoic Goughs Canyon Formation in the Osgood Mountains near PVA 6 has yielded a varied assemblage of corals, bryozoans, and brachiopods. Conodonts, fusulinids, bryozoans, corals, and brachiopods have been recovered from the Pennsylvanian to Permian Battle, Highway, Antler, Pumpernickel, and Havallah Formations in the Osgood Mountains and near Antler Peak in PVA 7. In Pumpernickel Valley lease applications NVN074855 and NVN060215 are located in close proximity to Pumpernickel and Havallah rocks. Lease applications NVN074276 and NVN074299 occur in PVA 11 near outcrops of the Pumpernickle and Havallah Formations, so there is a high likelihood the fossils exist there also. The Triassic Prida, Natchez Pass, Grass Valley, and Dun Glenn Formations have yielded a wealth of fossils such as icthyosaurs, sharks, ammonites, pelecypods, brachiopods, and hermatypic corals throughout the Humboldt Range. These formations occur on the west side of the Humboldt Range in PVA 9, where these fossils could also occur. Horse, cat, rabbit, rhino, camel, gomphothere (mastodon), and unidentified plant remains have been recovered from Miocene tuffaceous sediments in the Coal Canyon area in PVA 9. Lease applications NVN074902 and NVN075419 are located in this area. A petrified wood fossil of Tertiary age was found in the Trinity Range east of Toulon. An early Pliocene floral assemblage, consisting of 23 species, representing 6 conifers, 1 monocotyledon, and 16 dicotyledons, has been identified near Desert Peak at the southern end of the Humboldt River Region, but also near the West Central, and Truckee River Regions (portions of PVA 8 overlay these three regions). Oak, juniper, pine, cottonwood, poplar, and cedar are present in this assemblage. The same sedimentary rock units may be present in scattered locations in PVA 8 that lies within the West Central Region. In PVA 8, part of the Brady KGRA and lease applications NVN074871, NVN074872, NVN074873 are located in close proximity to the fossil assemblage. This sedimentary unit also occurs in scattered locations throughout the southern end of PVA 8, in the West Central and Truckee River Regions. A significant locality in PVA 9, near Rye Patch dam and Rye Patch KGRA, has yielded late Pleistocene elephant, horse, camel, and rodents. Other mammoth localities have been noted in this region. A fossil elephant was recorded at the west end of PVA 7, near Rose Creek. Lease application NVN074903 is located close to this site. A camel was identified within PVA 7 and a Holocene coyote was recovered in the Mazama ash, both near Winnemucca.

West Central Region. Miocene and Pliocene age volcanic and tuffaceous sedimentary rocks have yielded a wide variety of fossil plants and animals in this region especially within and near PVA 8. A rhino tooth of Miocene age has been reported in the Hot Springs Mountains. As stated above, an early Pliocene floral assemblage, consisting of 23 species, representing 6 conifers, 1 monocotyledon, and 16 dicotyledons, has been identified from the Chlorophagus Formation near Desert Peak in the Hot Springs Mountains at the southern end of the Humboldt River Region near the West Central Region. Oak, juniper, pine, cottonwood, poplar, and cedar are present in this assemblage. A large mammalian assemblage of Pliocene age commonly referred to as the “Brady Pocket” has been studied along the Nightingale Road north of the Brady KGRA in PVA 8. The following fauna identified in the Brady Pocket includes rodent, beaver, dog, cat, tapir, gomphothere (elephant family), rabbit, and camel. Localities adjacent to the Brady Pocket have also yielded fish and bird fossils. The remains are derived from tuffs, sands, shales, and pebble conglomerates of the Truckee Formation. A scatter of Pliocene vertebrate containing camel, horse, and a bird has been recorded near Sage Hen Creek in PVA 8. A Pliocene floral assemblage near Hazen, about 10 miles south of Brady KGRA in the Carson Desert Region, contains fossil walnut, shrub, avocado, oak, and sumac. An outcrop of petrified wood was noted in the Wildcat Canyon area of the Seven Troughs Range in PVA 8. Late Miocene fossils were recorded from diatomaceous sediments within PVA 8 in the vicinity of Eagle-Picher Mine including a few small leaves and fish.

Truckee River Region. Geologic units in this region with the potential of containing fossils are the Mesozoic sediments in the Nightingale Mountains and the Miocene and Pliocene volcanic sedimentary and tuffaceous units in the Truckee Range. An unnamed fossil of Jurassic age has been recovered from the Nightingale sequence at the north end of the Nightingale Range in PVA 8. As stated above, an early Pliocene floral assemblage, consisting of 23 species, representing 6 conifers, 1 monocotyledon, and 16 dicotyledons has been identified near Desert Peak, at the southern end of the Humboldt River Region near the Truckee River Region. Oak, juniper, pine, cottonwood, poplar, and cedar are present in this assemblage. The same sedimentary rock units appear to be present in scattered locations in PVA 8 that lies within the Truckee River Region. Lease applications NVN074913 and NVN074914, in the central Truckee Range, may be located in an area where related sedimentary units may occur. Several sites in the Winnemucca Lake area in or near PVA 8 have yielded fossils. Pleistocene fossil mountain lion, camel, horse, bighorn sheep, and cormorant were identified at Crypt Cave in the vicinity of Winnemucca Lake. Falcon Hill at the north end of Winnemucca Lake yielded a mandible of a Shrubox, a late Pleistocene animal. The remains of a cheetah have also been noted at this site. Fishbone Cave on Winnemucca Lake has yielded a vertebrate assemblage of Holocene age consisting of fish, lizards, ducks, coot, merganser camel, horse, and marmots. Several Holocene and Pleistocene fossil sites have been identified at Pyramid Lake. The assemblages include camel, horse, mammoth, bison, fish amphibians, reptiles, chipmunks, dogs, bighorn sheep, sloth, and jackrabbit. These locations are close to and similar to PVA 8 in the vicinity of Winnemucca Lake.

Carson Desert Region. Several Pliocene assemblages have been identified near Hazen, about 10 miles south of Brady KGRA. A flora assemblage contains fossil walnut, shrub, avocado, oak, and sumac. A vertebrate fauna assemblage has yielded ray-finned fish, bird, rodent, carnivore, and horse material. A locality southwest of Hazen has yielded fossil blue racer snake, stickleback fish, and camel from the Truckee Formation. These formations may also be present in PVA 8 and near the Brady KGRA.

Central Region. Conodonts and fusulinids have been recovered from Paleozoic Pumpernickel and Havallah Formations in PVA 7. There is a potential for the fossils to occur in PVA 13 because these formations are also present there. This region contains many fossiliferous rock units of Triassic age. Many of the Triassic fossiliferous sediments that occur in the Humboldt Range in PVA 9, also occur in the Tobin Range and the Augusta Mountains in PVA 13. Ammonites have been identified in the Triassic Prida Formation in the Tobin Mountain Range (in PVA 13). A newly discovered Triassic age reptile Augustasauras has been recovered from the Augusta Mountains along the east side of PVA 13 (Sander, et al 1997). The fossil was collected from the Favret Formation. A Ceolocanth has also been identified at the location. Fossil horse, camel, fish, rhino, beaver, and dogs of Miocene age have been recovered from tuffaceous sediments in Jersey Valley in PVA 13. Lease application NVN074883 is located here. Pleistocene bighorn sheep, and bison remains have been reported from Willow Creek area in the East Range. PVA 10 is located approximately six miles south of these locations. Similar fossils may exist there also. Lease applications NVN74276 and NVN74299 are present there at Kyle Hot Springs. Dixie Valley KGRA is the site of a Late Pleistocene mammoth and a fossil elephant has been identified from Sou Hot springs in PVA 13.

3.20.2 Environmental Impacts

3.20.2.1 Proposed Action

Direct Impacts – There are no direct impacts to issuing leases for future geothermal exploration, development, and production activities.

Indirect Impacts – The indirect impacts are represented in the "reasonably foreseeable development scenario" outlined below:

Exploration. Impacts to paleontological and paleoenvironmental resources during the exploration phase could vary from minimal to severe. Cross-country vibrosis seizmic work could impact surface sites. Drilling temperature gradient wells, associated well pad preparation, and access road construction could impact both surface and subsurface sites. If dessication of permanently wet areas, such as where springs or meadows occur, fossil pollen records could be destroyed. Increased accessibility could result in impacts to paleontological sites from hobbyist collecting and unauthorized commercial collecting.

Development. Surface disturbance during the development phase would be more extensive than the exploration phase, increasing the potential impacts to paleontological sites. Impacts to surface and subsurface paleontological and paleoenvironmental resources could occur from road construction, drill site development, geothermal pipelines, and power plant and transmission line construction. If dessication of permanently wet areas, such as springs or meadows, occurs, fossil pollen records could be destroyed. As in the exploration phase, roads, pipelines, and transmission lines could increase un-permitted collecting.

Production. Most, if not all impacts to paleontological resources would have occurred prior to the production phase. Very few changes affecting palenotological or paleoenvironmental resources would occur during this scenario phase.

Close-out. Previously undisturbed paleontological or paleoenvironmental resources could be impacted if any new surface disturbance occurs during rehabilitation activities.

3.20.2.2 No Action Alternative

Direct Impacts – There would be no direct impacts to paleontological or paleoenvironmental resources.

Indirect Impacts – Indirect impacts from the No Action Alternative would be similar to those described in the Proposed Action; however, updated mitigation measures and stipulations would not apply using the 1982 Geothermal EA.

4.0 CUMULATIVE IMPACTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

4.1 CUMULATIVE IMPACTS

The CEQ regulations for implementing NEPA defines cumulative impacts as:

> *". . . the impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time"*[49]

Therefore, a cumulative impact analysis is based on a series of assumptions concerning future plans and/or projects and information about their character and timing. Cumulative impacts are examined by combining the effects of the proposed project alternatives with the effects of other past, present, and reasonably foreseeable activities in the regions of influence.

Past and Present. For a number of reasons, not all geothermal leases conclude with new geothermal development and production. The WFO has issued approximately 50 geothermal energy leases. Of these leases, only five were developed into producing plants (three power plants and two dehydration plants). Past and present surface disturbance within the WFO and Dixie Valley KGRA is approximately 600 acres (three WFO power plants, one Dixie Valley power plant, two WFO dehydration plants).

Future. The WFO currently has approximately 48 pending lease applications. Based on past and present leasing verses development/production statistics, we can reasonably expect that approximately another five new plants would result in development and production. Because power plants disturb more acres than dehydration plants, the "worse case" scenario is to project five new, 15-megawatt geothermal power plants as a "reasonably foreseeable development scenario." Using this projected estimate, we expect that approximately 1,200 acres of land would be disturbed as a result geothermal energy exploration, development, and production (approximately 600 past and present and approximately 600 reasonably foreseeable (see Table 2-2)). Using a baseline of approximately 2 million acres within the assessment area, this amounts to a total disturbance of approximately .0006 percent.

The cumulative impacts on hydrology and water quality; vegetation and noxious weeds; visual resources; wildlife, migratory birds, and fisheries; threatened, endangered, and special status species; geology and minerals; and hazardous materials/waste and solid waste could have undesirable effects if all five "reasonably foreseeable development scenario" power plants were approved to be built in the same geographical area or relatively near existing power plants.

[49] Council on Environmental Quality, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR §§1500-1508)

However, if these five power plants were equally distributed throughout the assessment area, no appreciable cumulative impacts would result from the addition of these facilities individually or to the existing power plants.

4.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitments of resources are those resources that cannot be reversed or are lost for an extremely long period of time. Irretrievable commitments of resources are those that are lost for a short period of time (usually for the time period for which the resources are used) and that would be restored over time. There are no irreversible commitments of resources for leasing. However, if all five "reasonably foreseeable development scenario" facilities (five new 15-megawatt geothermal power plants) were to come on line together and concentrated within a small geographical area, there could be some irreversible and irretrievable commitments of the geothermal resources in that area. Over time, the geothermal resource temperature is expected to decrease to the point that it would no longer be economically feasible to use as a heat source for generating electrical power.

The following is a brief summary of the resources that could be expected to have irretrievable consequences:

Hydrology and Water Quality. Because of the large volume and long duration of geothermal fluid production, the production stage of resource development is likely to have to the greatest potential for impact to hydrologic resources. These impacts could occur in terms of changes to the hydraulics of the geothermal and groundwater reservoirs and spent geothermal fluid disposal. Hydraulic head pressures in the geothermal and adjacent groundwater reservoirs could change during production. The result could include reduction in spring discharge rates and lowering of water levels in wells. Disposal of spent fluids by injection could also affect hydraulic heads and could introduce low quality fluids to groundwater pathways that discharge at springs or wells. This could also affect the quality of available water. Surface disposal of spent fluids could create large pools of low quality water. Changes in spring flow and development of spent fluid holding ponds could induce changes to wetlands supported eco-systems and habitats. As a result, hydrologic impacts associated with geothermal development could have secondary impacts in the plant and animal community supported by natural or created wetlands.

Noxious Weeds. Introduction of noxious weeds into previously clean areas would be probable during all phases of geothermal development by construction and support vehicles. The development phase would present the greatest opportunity for noxious weed introduction and proliferation. Once introduced, control or eradication of noxious weeds could be difficult.

Visual Resources. Any changes in the characteristic landscape of the affected areas due to geothermal energy development could be visible for many years. Succession in the Basin and Range geomorphic province is very slow due to the lack of rainfall. Rehabilitation techniques could use non-indigenous plant species, thus changing the character of the area. The amount of contrast would vary by area, rehabilitation techniques, and the success of those techniques. All landscapes are unique in their own right and any change or loss of scenic values is irretrievable. Those losses become more significant in areas of unique or outstanding scenic quality.

Threatened, Endangered, and Special Status Species. Loss of any species is irretrievable. Protection of threatened, endangered, and special status species is governed by Federal and State statute. To minimize the effects on threatened, endangered, and special status species, the lessee would be required to complete a site-specific NEPA document outlining their proposed action and alternatives, and the direct and indirect impacts of their proposed action on any threatened, endangered, and special status species prior to any occupancy and surface disturbance.

Geology and Minerals. The principle commitment of resources in implementing the proposed action would be the depletion of thermal energy and water from the geothermal reservoirs tapped for energy use. To minimize this effect, the super-hot water extracted from the subterranean geothermal reservoirs through production wells is injected back into the reservoir for reheating and reuse. Over time, these resources (heat and water) could be depleted to the point that the power generating plant would no longer be economically productive.

Cultural Resources. Destruction and/or loss of cultural resources are irretrievable. Federal and State statute govern the protection of cultural resources. To minimize the effects on cultural resources, the lessee would be required to complete a site-specific NEPA document outlining their proposed action and alternatives, and the direct and indirect impacts of their proposed action on the cultural resources within the lease area prior to any occupancy and surface disturbance.

Hazardous Materials/Waste and Solid Waste. If handled improperly, hazardous materials/waste and solid waste have the potential to create irretrievable consequences. The storage, use, and disposal of hazardous materials/waste and solid waste are governed by Federal and State statute. To minimize the effects hazardous materials/waste and solid waste, the lessee would be required to complete a site-specific NEPA document outlining their proposed action and alternatives, and the direct and indirect impacts of hazardous materials/waste and solid waste associated with their proposed action prior to any occupancy and surface disturbance.

4.3 RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

The leasing of land for geothermal exploration and development involves the commitment of the available resources of the land, water, and air of the leased sites. It is significant to note that geothermal energy is a dissipating resource. The energy that is lost through natural heat transfer goes unused if it is not tapped and put into useful production. If left unused and undeveloped, not only is the potential energy ignored, but also a substantial revenue source for both county(s) and State is lost.

Geothermal resources are only limited by the amount of fluids available to transfer the thermal energy to the earth's surface, since the heat source itself is unlimited. Awareness of the duration of geothermal field capacity is found in the Geothermal Steam Act of 1970.[51] Section 1005 (a)

[50] Federal Land Policy Management Act of 1976 (43 USC §1701; 36 CFR §2310.1-2, 1600 Series)
[51] Geothermal Steam Act of 1970 (P.L. 91-582 as amended (30 USC §1001 *et seq.*))

and (b) of this Act allows a preliminary 10-year lease plus two successive 40-year extensions if commercial steam is being produced—a total of 90 years from initial lease issuance.

The exploration and testing phases of geothermal leasing are designed to determine the nature and extent of the geothermal resources. Generally the active portion of this phase is of short duration. Where such exploration proves unsuccessful, these lands would not be used for subsequent development and production. These lands would be restored, as much as possible, to their original condition upon termination of exploration and testing activities. However, if geothermal activities progress beyond the exploration and testing phase into long-term productivity, the lands could be affected to a greater extent. This would depend on the degree of development (i.e., surface disturbance) and the geothermal resource potential.

Over the long-term, while geothermal power plants are in production, these new electrical power plants would be producing a low-cost, clean source of renewable energy for use in Nevada and other western states. While in production, each plant would provide employment opportunities for citizens of the surrounding communities and the sale of this new electrical energy would be a new source of revenue for the counties within which they located, and for the State of Nevada.

5.0 COORDINATION AND CONSULTATION

5.1 LIST OF PREPARERS

5.1.1 Bureau of Land Management

Barker, Pat – Ethnography/Native American Consultation

Burke, Tom – Ethnography/Native American Consultation

Cates, Delores – Geothermal/Geology/Minerals, Paleontology

Covert, Clarence – Wildlife/ Migratory Birds/Fisheries/Threatened, Endangered, and Special Status Species

Detweiler, Ken – Lands/Realty

Drake, Craig – Water Resources

Herrick, Rod – Hazardous Materials

Johnson, Jeffrey – Project Management

Keleher, Barbara – Recreation/NCA, Wilderness, WSAs

Levy, Laura – Geographic Information System

McGuckian, Peggy – Archaeology/Cultural Resources, Paleontology

Meyer, Paul – Socio-Economic

Neill, Chuck – Noxious Weeds

Paine, Nadine – Wild Horses/Burros

Seidlitz, Gene – Range Resources

Varner, Matt – Fisheries

Zielinski, Mike – Air Quality/Soils/Vegetation

5.1.2 Charis Professional Services Corporation

Barry, Jennifer – Range Resources/NCA, Wilderness, WSAs
B.S., Environmental Science, University of Massachusetts, 1998
M.A., Environmental Studies, University of Illinois, 2001
Years of Experience: 4

Briggs, Joshua – Geographic Information Systems
Years of Experience : 5

Charlton, David – Noxious Weeds, Vegetation
B.S., Plant Science/Biology, Cal Poly Pomona, 1974
M.S., Ornamental Horticulture/Botany, Cal Poly San Luis Obispo, 1980
Years of Experience: 28

Earll, Sonya – Visual Resources, Recreation, Socio-Economic
B.S., Biology, California State University-San Bernardino, 2000
Years of Experience: 2

Garner, William – Project Manager
B.G.S., Business Management, University of New Hampshire, 1974
M.B.A., Business Administration, Gonzaga University, 1980
Years of Experience: 30

Grainger, David – Hazardous Materials
B.S., Environmental Sciences, University of California-Riverside, 1996
Years of Experience: 6

Wertenberger, Marcia – Lands/Realty
B.S., Environmental Science, Sierra Nevada College, 1984
M.S., Natural Resource Management, Cal Poly-San Luis Obispo
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Years of Experience: 11

5.1.3 Desert Research Institute

Bullard, Thomas – Soils
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M.S., Geology, University of New Mexico, 1985
Ph.D., Geology, University of New Mexico, 1995
Years of Experience: 30

Gertler, Alan – Air Quality
B.S., Chemistry, State University of New York-Albany, 1974
Ph.D., Physical Chemistry, University of California-Los Angeles, 1979
Years of Experience: 28

Jacobson, Roger – Geothermal
B.S., Geology, University of Minnesota, 1965
M.S., Geology, University of Missouri, 1968
Ph.D., Geochemistry and Mineralogy, Pennsylvania State University, 1973
Years of Experience: 37

Johnson, William – Cultural Resources
B.S., Anthropology, Florida International University, 1979
M.S., Archaeology, University of South Florida Public, 1986
Ph.D., Anthropology, University of Florida, 1991
Years of Experience: 23

Mizell, Steve – Water Resources
B.S., Geology, Baylor University, 1973
M.S., Hydrology/Hydrogeology, University of Nevada, 1975
Ph.D., Geoscience-Hydrogeology, New Mexico Institute of Mining and Technology, 1980
Years of Experience: 29

Sada, Donald – Wild Horses/Burros; Wildlife; Threatened and Endangered Species; Migratory Birds; Fisheries
B.S., Biology, University of the Pacific-Stockton, 1973
M.S., Biology, California State University-Long Beach, 1977
Ph.D., Biology, University of Nevada-Reno, 1990
Years of Experience: 29

5.1.4 SWCA Environmental

Bengston, Ginny – Ethnography/Native American Consultation
B.A., Anthropology, University of Washington, Seattle, 1990
M.A., Applied Anthropology, Northern Arizona University, 1992
Years of Experience: 12

5.2 AGENCIES, GROUPS, AND INDIVIDUALS CONTACTED

5.2.1 Federal Agencies

- U.S. Fish & Wildlife Service (USFWS). The Endangered Species Act of 1973 (16 USC §1531 *et seq.*) makes the USFWS responsible to maintain lists of threatened and endangered species. Under this Act, Section 7 requires Federal agencies to enter into consultation with the FWS for Federal projects that require permits where such actions could directly or indirectly affect any proposed or listed species.

The BLM sent at letter to the USFWS, reference: 3072 (NV-022.32), dated May 1, 2002, notifying the FWS of the Proposed Action and requesting a list of the affected threatened and endangered species in the study area (see Appendix C).

- Environmental Protection Agency

5.2.2 State Agencies

- State of Nevada Clearinghouse
- Nevada Division of Wildlife
- State Historic Preservation Office

5.2.3 Local Governments

- Humboldt County Commission
- Pershing County Commission

5.2.4 Native American Groups

Native American Consultation. Executive Order 13084, *Consultation and Coordination with Indian Tribal Governments;* and Presidential Memorandum, *Memorandum for Heads of Executive Departments and Agencies on Government-To-Government Relations with Native American Tribal Governments* establishes a requirement for the BLM to enter into consultation with Native American tribes with interests in the geothermal activity in the study area.

The BLM entered into formal consultations with 20 separate Native American tribes in relation to this Proposed Action. Consultation was initiated with a letter to tribal government leaders, reference: 1610/8160 (NV-020) dated April 30, 2002 (see Appendix E). Each letter was followed-up with phone calls to ensure the letter was received, to ascertain any specific concerns, and to arrange follow-up meetings.

The following is a list the Native American tribes and organizations contacted as part of this project:

- Alturas Indian Rancheria
- Battle Mountain Band
- Burns Paiute Tribe
- Cedarville Rancheria
- Confederated Tribes of the Warm Springs Reservation
- Duck Valley Shoshone-Paiute Tribe
- Fallon Paiute-Shoshone Tribe
- Fort Bidwell Indian Community
- Fort McDermitt Tribe
- Inter-Tribal Council of Nevada
- Klamath Tribe
- Lovelock Paiute Tribe
- Pit River Tribe
- Pyramid Lake Paiute
- Shoshone-Bannock Tribes
- Summit Lake Paiute Tribe
- Susanville Indian Rancheria
- Walker River Paiute Tribe
- Washoe Tribe
- Winnemucca Tribe

5.2.5 Other Groups and Individuals

On May 15, 2002, the BLM mailed an "interested party" letter to approximately 200 groups and individuals with potential interest in this project. This letter briefly outlined the purpose and need for the project, advertised two public scoping meetings, announced the proposed release of the PEA and public comment period, and listed sources for additional information. A copy of the letter is at Appendix F.

6.0 REFERENCES AND SELECTED BIBLIOGRAPHIES

Air Quality

US EPA Office of Air Quality Planning and Standards, *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD),* EPA-450/4-87-007, Research Triangle Park, North Carolina, 27711.

US EPA Office of Air Quality Planning and Standards, *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II: Part 1,* EPA-454/R-98/004, Research Triangle Park, North Carolina, 27711.

US EPA Office of Research and Development, *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, A Field Guide to Environmental Quality Assurance,* EPA-600/R-94/038a, Washington, DC, 20460.

US EPA Office of Research and Development, *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods (Interim Edition),* EPA-600/R-94/038b, Washington, DC, 20460

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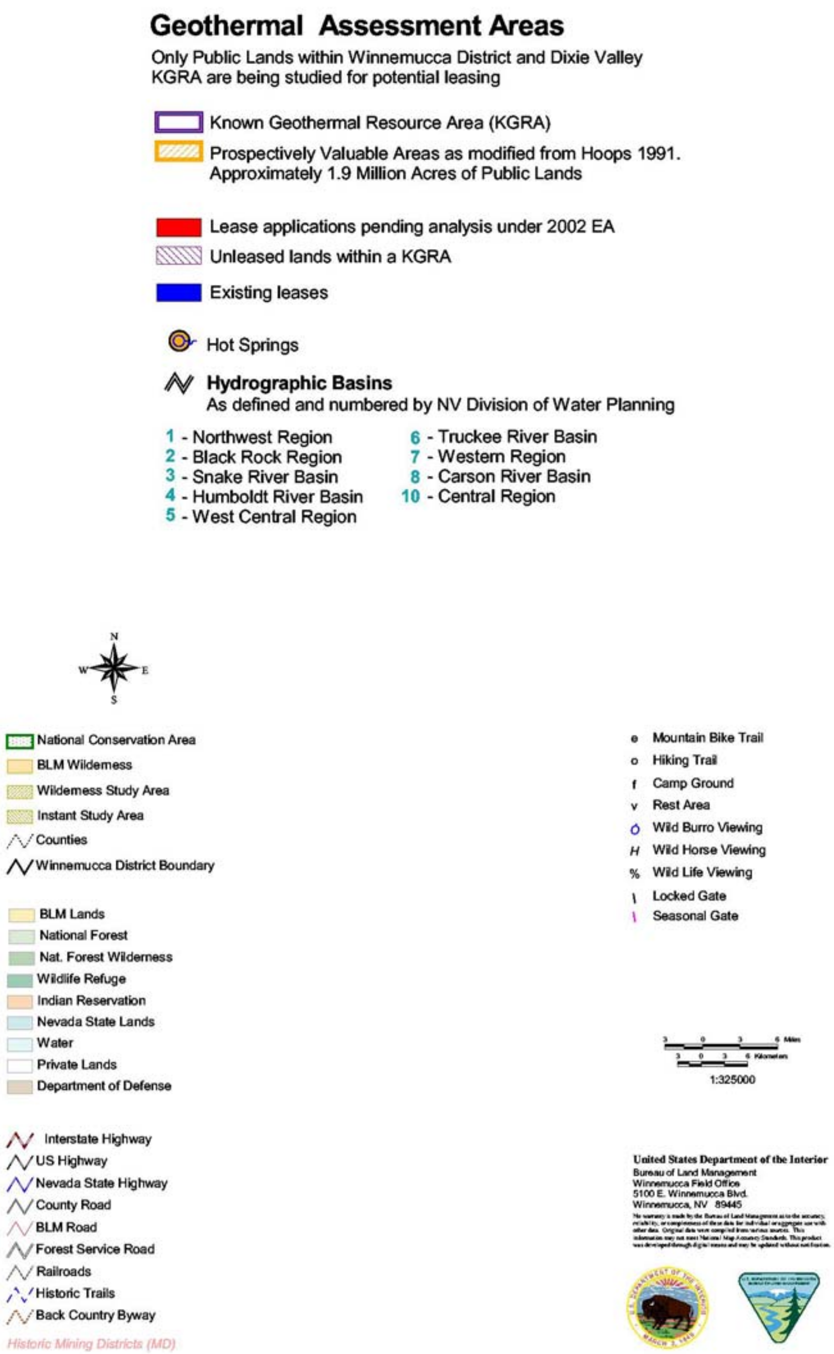
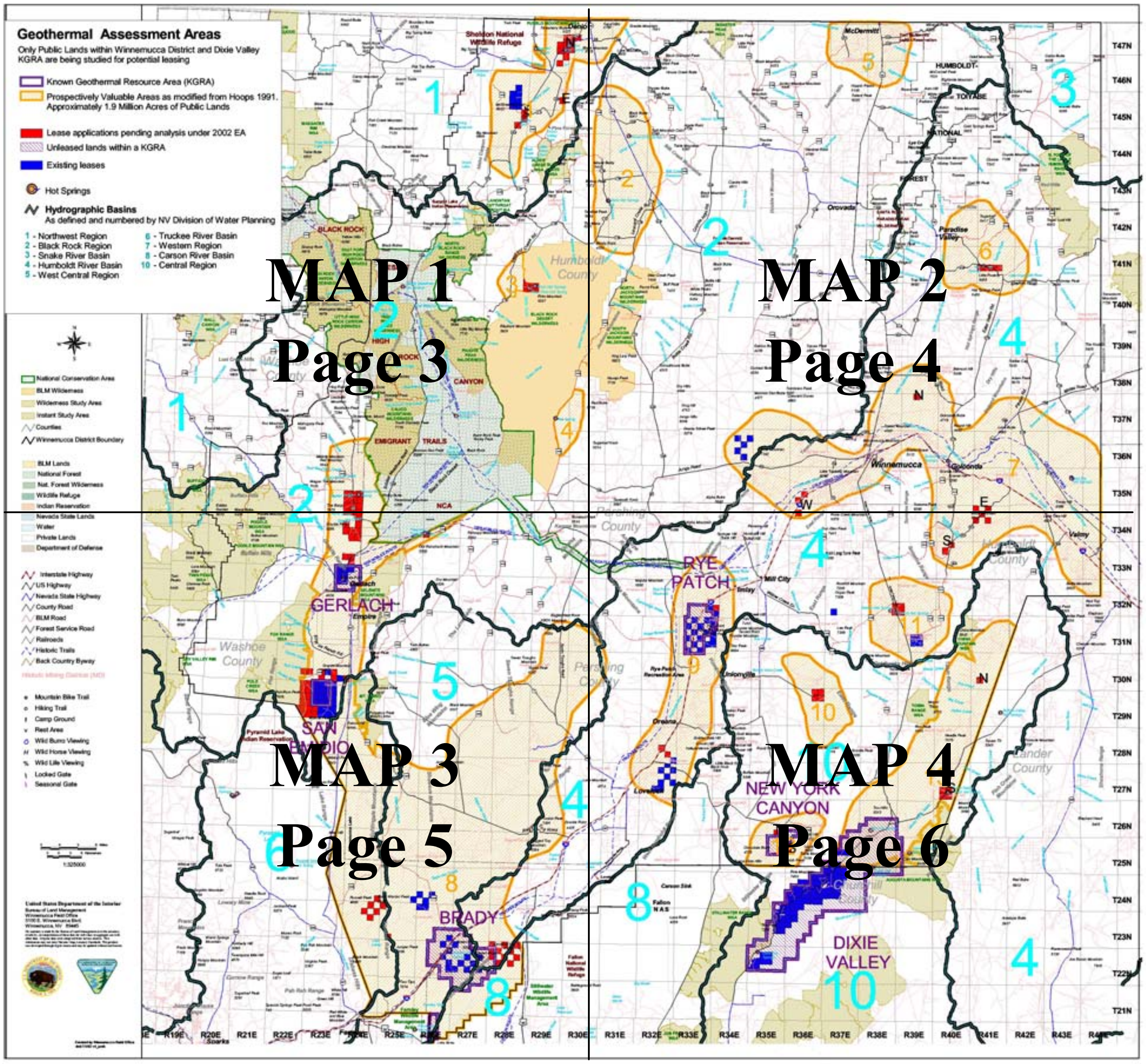
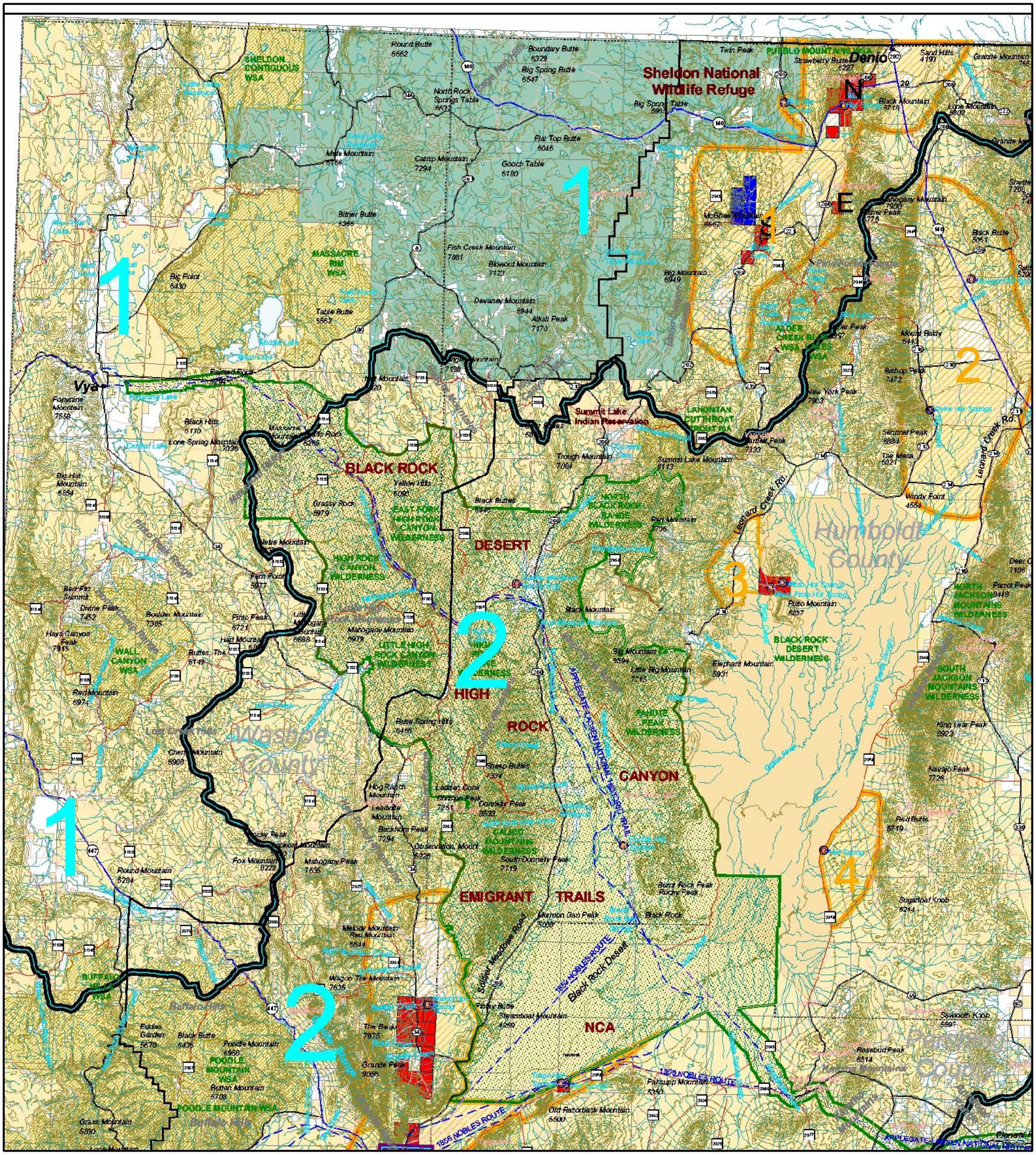
APPENDIX A

DETAILED ASSESSMENT AREA MAP





Geothermal Assessment Areas
Only Public Lands within Winnemucca District and Dixie Valley KGRA are being studied for potential leasing
Known Geothermal Resource Area (KGRA)
Prospectively Valuable Areas as modified from Hoops 1991. Approximately 1.9 Million Acres of Public Lands
Lease applications pending analysis under 2002 EA
Unleased lands within a KGRA
Existing leases
Hot Springs
Hydrographic Basins
As defined and numbered by NV Division of Water Planning
1 - Northwest Region
2 - Black Rock Region
3 - Snake River Basin
4 - Humboldt River Basin
5 - West Central Region
6 - Truckee River Basin
7 - Western Region
8 - Carson River Basin
10 - Central Region
MAP 1
Page 3
MAP 2
Page 4
MAP 3
Page 5
MAP 4
Page 6
GERLACH
SAN EMIDIO
BRADY
RYE PATCH
NEW YORK CANYON
DIXIE VALLEY


Sheldon National Wildlife Refuge
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DESERT
HIGH
ROCK
CANYON
EMIGRANT
TRAILS
NCA
Humboldt County
Washoe County
Pershing County
SHELDON CONTIGUOUS WSA
MASSACRE RIM WSA
WALL CANYON WSA
BUFFALO HILLS WSA
POODLE MOUNTAIN WSA
BLACK ROCK DESERT WILDERNESS
PAHUTE PEAK WILDERNESS
CALICO MOUNTAINS WILDERNESS
NORTH JACKSON MOUNTAINS WILDERNESS
SOUTH JACKSON MOUNTAINS WILDERNESS
Summit Lake Indian Reservation
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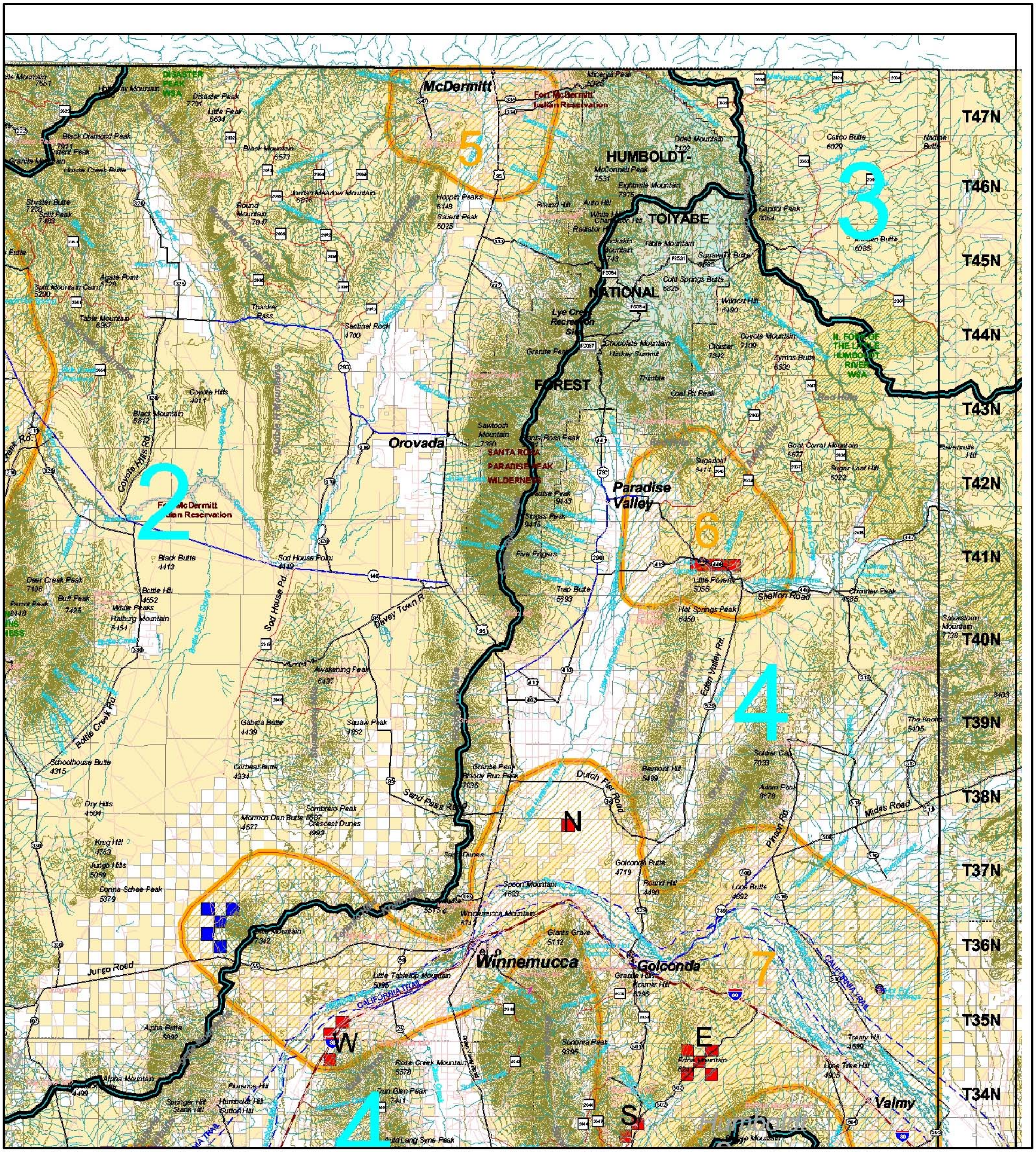
McDermitt
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TOIYABE
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Paradise Valley
Winnemucca
Golconda
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Dutch Flat Road
Sand Pass Road
Eden Valley Rd.
Shelton Road
Midas Road
Pinon Rd
Sod House Rd.
Davey Town Rd.
Coyote Hills Rd.
Bottle Creek Rd.
CALIFORNIA TRAIL
SANTA ROSA PARADISE PEAK WILDERNESS
Fort McDermitt Indian Reservation
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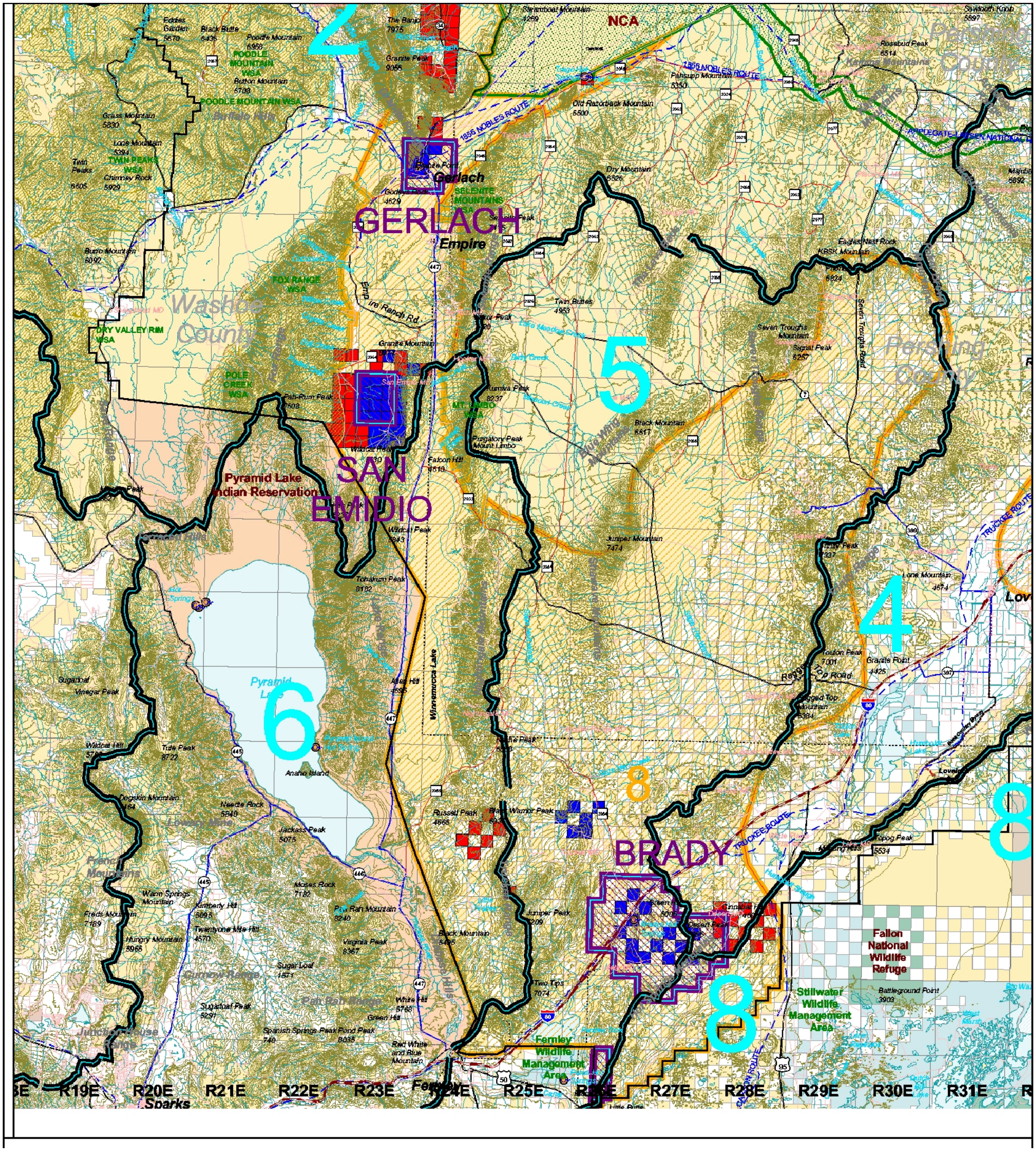

NCA
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GERLACH
Gerlach
Empire
Washoe County
Pershing County
5
SAN EMIDIO
Pyramid Lake Indian Reservation
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Pyramid Lake
4
8
BRADY
Fallon National Wildlife Refuge
Stillwater Wildlife Management Area
Fernley Wildlife Management Area
R19E
R20E
R21E
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R24E
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R27E
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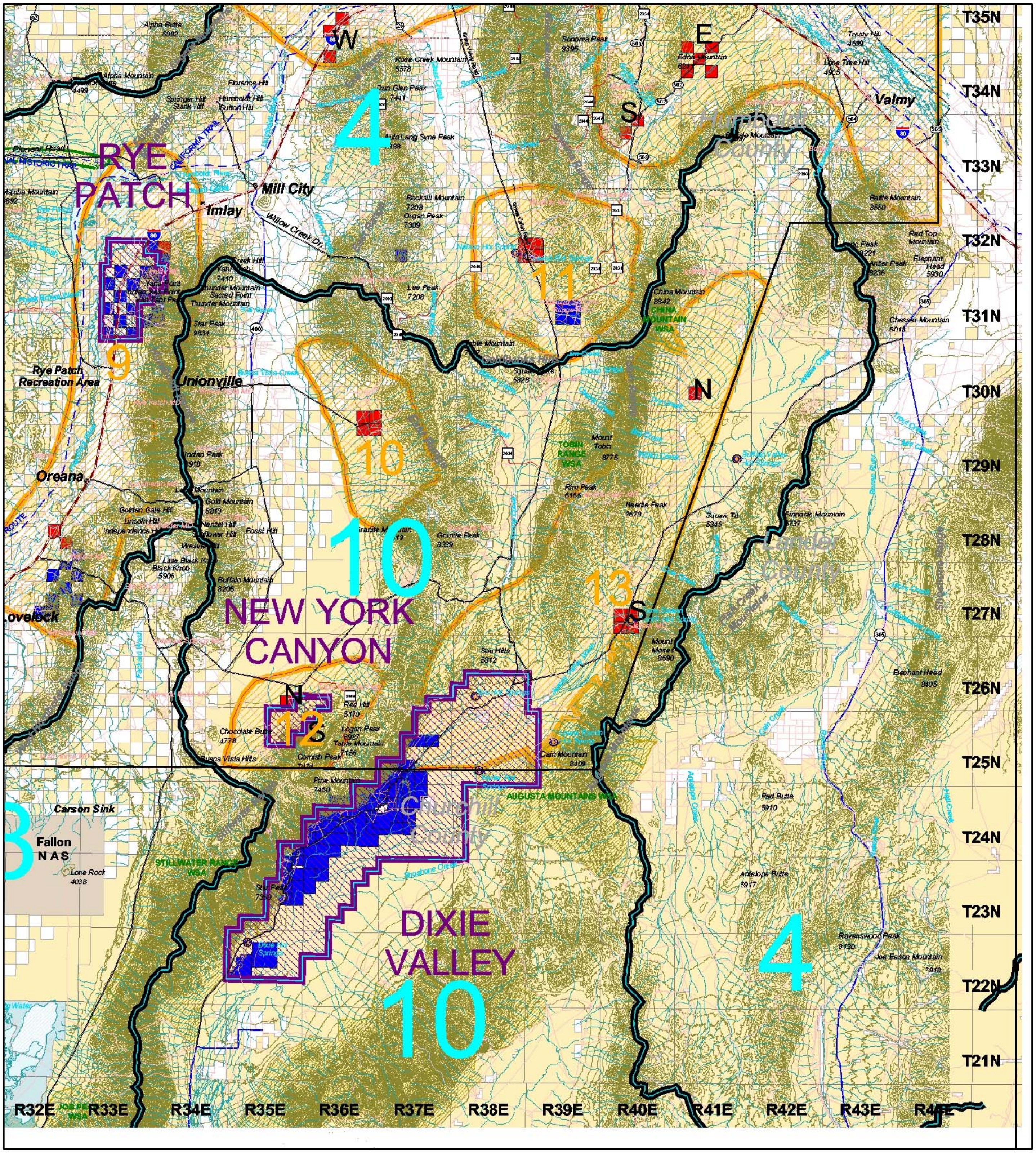
R29E
R30E
R31E
Sparks



RYE PATCH
NEW YORK CANYON
DIXIE VALLEY
Mill City
Imlay
Unionville
Oreana
Lovelock
Valmy
Rye Patch Recreation Area
Carson Sink
Fallon NAS
Humboldt County
Pershing County
Lander County
Churchill County
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R36E
R37E
R38E
R39E
R40E
R41E
R42E
R43E
R44E

APPENDIX B
SHADSCALE - BLACK GREASEWOOD SEED MIX

Species	PLS Pounds/Acre	Bulk Pounds/Acre	PLS/Square Foot
Fourwing saltbush	3.00	5.00	4
Shadscale	3.00	5.00	4
Indian ricegrass	1.00	1.25	4
Forage kochia	0.50	0.75	5
Crested wheatgrass	2.50	3.00	10
Black greasewood	0.50	1.00	3
Totals	10.50	16.00	30

SHADSCALE SEED MIX

Species	PLS Pounds/Acre	Bulk Pounds/Acre	PLS/Square Foot
Fourwing saltbush	3.00	5.00	4
Shadscale	3.00	5.00	4
Indian ricegrass	1.00	1.25	4
Forage kochia	0.50	0.75	5
Crested wheatgrass	2.50	3.00	10
Totals	10.00	15.00	27

WYOMING BIG SAGEBRUSH MIX

Species	PLS Pounds/Acre	Bulk Pounds/Acre	PLS/Square Foot
Fourwing saltbush	2.00	3.00	3
Blue flax	0.50	0.75	4
Alfalfa	1.80	2.00	10
Forage kochia	0.50	0.75	5
Crested wheatgrass	2.50	3.00	10
Wyoming sagebrush	0.20	2.00	14
Totals	7.50	11.50	46

MOUNTAIN BIG SAGEBRUSH SEED MIX

Species	PLS Pounds/Acre	Bulk Pounds/Acre	PLS/Square Foot
Basin wildrye	2.50	3.00	7
Thickspike wheatgrass	2.50	3.00	10
Bluebunch wheatgrass	2.50	3.00	10
Blue flax	0.50	0.75	4
Palmer penstemon	0.50	0.75	6
Fourwing saltbush	2.00	3.00	3
Mountain sagebrush	0.10	1.00	7
Wyoming sagebrush	0.10	1.00	14
Totals	10.70	15.50	61

PLS = Pure Live Seed

Native species-varieties: fourwing saltbush; shadscale; black greasewood; Indian ricegrass; Wyoming big sagebrush; basin wildrye-Magmar; thickspike wheatgrass-Critana; bluebunch wheatgrass-Secar; penstemon-Palmar; mountain big sagebrush

Introduced species-varieties: Forage kochia-Immigrant; crested wheatgrass-Hycrest -Nordan-Siberian; Blue flax-Appar; alfalfa-Ladak

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Winnemucca Field Office
5100 East Winnemucca Boulevard
Winnemucca, Nevada 89445
(775) 623-1500
http://www.nv.blm.gov/winnemucca

In Reply Refer To:
3072
(NV-022.32)

5-1-02

Mr. Robert D. Williams, State Supervisor
Fish and Wildlife Service, Nevada State Office
1340 Financial Blvd.
Reno, Nevada 89502-7147

Dear Mr. Williams:

I am writing to you to request a Threatened and Endangered species list for lease locations, known geothermal resource areas, and prospectively valuable lands being considered for potential geothermal resource leasing. The enclosed map shows the potential geothermal lease locations. This information will be used by Donald W. Sada, Associate Research Scientist, Division of Hydrologic Sciences, Desert Research Institute, 2215 Raggio Parkway, Reno, NV 89512-1095 for work on the Winnemucca District Geothermal Programatic environmental assessment.

Thank you for your assistance and if you have any questions please call Clarence L. Covert at (775-623-1571).

Sincerely yours,

Clarence L. Covert

Clarence L. Covert
Wildlife Biologist
Renewable Resources

Enclosure

FILE COPY

RECEIVED BLM
WINNEMUCCA NV

United States Department of the Interior

2002 MAY 14 AM 11:26

FISH AND WILDLIFE SERVICE

NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NEVADA 89502-7147

May 13, 2002
File No.1-5-02-SP-191

Memorandum

To: Clarence L. Covert, Wildlife Biologist Renewable Resources, Bureau of Land Management, Winnemucca, Nevada

From: Field Supervisor, Nevada Fish and Wildlife Office, Reno, Nevada

Subject: Species List for Geothermal Resources on the Winnemucca District, BLM

In response to your memorandum received on May 02, 2002, we have enclosed a list of threatened, proposed, and candidate species which may occur in the subject project area (Enclosure A). This list fulfills the requirement of the Fish and Wildlife Service (Service) to provide information on listed species pursuant to section 7(c) of the Endangered Species Act of 1973, as amended (Act), for projects that are authorized, funded, or carried out by a Federal agency. Enclosure B provides a discussion of the responsibilities Federal agencies have under section 7 of the Act and the conditions under which a biological assessment (BA) must be prepared by the lead Federal agency or its designated non-Federal representative.

Your proposed project is located within a potential metapopulation for Lahontan cutthroat trout (LCT), and as such, the area may be necessary for the species' recovery. The Northwest Distinct Population Segment Team (NWDPS) has been formed to facilitate the restoration and recovery of LCT populations in this area. The NWDPS will be evaluating areas within this basin which could support LCT. Although a self-sustaining population of LCT may not currently be present in the project area, under the Act, completed projects should not preclude future recovery and survival of this species. We recommend that projects be reviewed for all direct and indirect impacts that they may have on riparian and aquatic habitats as they relate to LCT, and that you consult with the Service accordingly under section 7 of the Act.

For your consideration, Enclosure A also contains a list of other species of concern to the Service which may occur in the project area. The Service has used information from State and Federal agencies and private sources to assess the conservation needs and status of these species. Further biological research and field study are needed to resolve their conservation status. By considering these species and exploring management alternatives early in the planning process, it may be possible to provide long-term conservation benefits for these species and avoid future conflicts that could otherwise develop. We recommend that you contact the Nevada Natural Heritage Program [1550 East College Parkway, Suite 145, Carson City, Nevada 89710, (775) 687-4245] and the appropriate regional office of the Nevada Division of Wildlife, as well as other local, State, and Federal agencies for distribution data and information on the conservation needs of these and other species of concern.

We note that one or more springs occur within or near the project area. Springs are sensitive to a wide variety of activities and may be occupied by rare aquatic organisms (macroinvertebrates) that may be affected by the proposed action(s). A number of recent studies have found approximately 100 species of aquatic macroinvertebrates in springs and springbrooks throughout the western United States, including springsnails, caddisflies, beetles, true bugs, and crustaceans. There is concern for these species because some are narrowly distributed and, in many cases, their habitats have become highly degraded. Many springs in Nevada have not yet been surveyed to determine if they are occupied by macroinvertebrates. Limited ecological information has been collected; however, gravel substrate, flowing high quality water, and minimal disturbance are believed to be important habitat components to maintain viable populations of these species.

Because wetlands, springs, or streams are known to occur in the project area, we ask that you be aware of potential impacts project activities may have on these areas. Discharge of fill material into wetlands or waters of the United States is regulated by the Army Corps of Engineers (Corps) pursuant to section 404 of the Clean Water Act. We recommend you contact the Corps' Regulatory Section [300 Booth Street, Room 2103, Reno, Nevada 89509, (775) 784-5304 or 321 North Mall Drive, Suite L-101, St. George, Utah 84790-7314, (435) 986-3979] regarding the possible need for a permit.

Please reference File No. 1-5-02-SP-191 in future correspondence concerning this species list. If you have any questions or require additional information, please contact me or Chad Mellison at (775) 861-6300.

Laurie R. Sada

for Robert D. Williams
Field Supervisor

Enclosures

ENCLOSURE A

THREATENED, PROPOSED, AND CANDIDATE SPECIES
AND SPECIES OF CONCERN
that may occur in
GEOTHERMAL RESOURCE AREAS IN THE WINNEMUCCA DISTRICT
BUREAU OF LAND MANAGEMENT
Nevada

File No. 1-5-02-SP-191; May 13, 2002

Threatened Species

Bird

T	Bald eagle	*Haliaeetus leucocephalus*

Fish

T	Desert dace	*Eremichthys acros*
T	Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*

Proposed Threatened

Bird

PT	Mountain plover	*Charadrius montanus*

Candidate Species

Bird

C	Western yellow-billed cuckoo	*Coccyzus americanus*

Species of Concern

Mammals

Pygmy rabbit	*Brachylagus idahoensis*
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii*
Spotted bat	*Euderma maculatum*
Small-footed myotis	*Myotis ciliolabrum*

Long-eared myotis	*Myotis evotis*
Fringed myotis	*Myotis thysanodes*
Long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
Preble's shrew	*Sorex preblei*
Birds	
Northern goshawk	*Accipiter gentilis*
Western burrowing owl	*Athene cunicularia hypugea*
Sage grouse	*Centrocercus urophasianus*
Black tern	*Chlidonias niger*
Least bittern	*Ixobrychus exilis hesperis*
White-faced ibis	*Plegadis chihi*
Fish	
Alvord chub	*Gila alvordensis*
Pleasant Valley tui chub	*Gila bicolor* ssp.
Sheldon tui chub	*Gila bicolor eurysoma*
Invertebrates	
California floater	*Anodonta californiensis*
Rice's blue butterfly	*Euphilotes pallescens ricei*
Nevada viceroy	*Limenitus archippus lahontani*
Denio sandhill skipper	*Polites sabuleti sinemaculata*
Springsnail species	*Pyrgulopsis augustae*
	Pyrgulopsis aurata
	Pyrgulopsis dixensis
	Pyrgulopsis gibba
	Pyrgulopsis imperialis
	Pyrgulopsis limaria
	Pyrgulopsis longiglans
	Pyrgulopsis militaris
	Pyrgulopsis notidicola
	Pyrgulopsis pictilis
	Pyrgulopsis sadai
	Pyrgulopsis umbilicata
Plants	
Weak milkvetch	*Astragalus solitarius*
Tiehm's milkvetch	*Astragalus tiehmii*
Osgood Mountains milkvetch	*Astragalus yoder-williamsii*
Schoolcraft's cryptantha	*Cryptantha schoolcraftii*
Goodrich biscuitroot	*Cymopterus goodrichii*
Windloving buckwheat	*Eriogonum anemophilum*

Crosby's buckwheat	*Eriogonum crosbyae*
Grimy ivesia	*Ivesia rhypara* var. *rhypara*
Bruneau River prickly phlox	*Leptodactylon glabrum*
Smooth stickleaf	*Mentzelia mollis*
Nevada oryctes	*Oryctes nevadensis*
Nevada dune beardtongue	*Penstemon arenarius*
Cordelia beardtongue	*Penstemon floribundus*
Obscure scorpion plant	*Phacelia inconspicua*
Soldier Meadows cinquefoil	*Potentilla basaltica*

ENCLOSURE B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7 (a) AND (c) OF THE ENDANGERED SPECIES ACT

SECTION 7 (a): Consultation/Conference
Requires:

1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2) Consultation with the Fish and Wildlife Service (Service) when a Federal action may affect a listed endangered or threatened species to insure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the Federal agency after determining the action may affect a listed species or critical habitat;

3) Conference with the Service when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat.

SECTION 7 (c): Biological Assessment - Major Construction Activity 1/
Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for major construction activities. The BA analyzes the effects of the action on listed and proposed species. The process begins with a Federal agency requesting from the Service a list of proposed and listed threatened and endangered species. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the list, the accuracy of the species list should be informally verified with the Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may proceed; however, no construction may begin.

We recommend the following for inclusion in the BA:

1. An onsite inspection of the area affected by the proposal which may include a detailed survey of the area to determine if the species or suitable habitat are present.

2. A review of literature and scientific data to determine species distribution, habitat needs, and other biological requirements.

3. Interviews with experts, including those within the Service, State conservation departments, universities, and others who may have data not yet published in scientific literature.

4. An analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat.

5. An analysis of alternative actions considered.

6. Documentation of study results, including a discussion of study methods used, any problems encountered, and other relevant information.

7. Conclusion as to whether or not a listed or proposed species will be affected.

Upon completion, the BA should be forwarded to our office with a request for consultation, if required.

1/ A construction project (or other major undertaking having similar physical impacts) is a major Federal action significantly affecting the quality of the human environment as referred to in NEPA (42 U.S.C. 4332 (2) C).

APPENDIX D
Cultural Resources Data

This appendix is a compilation of all cultural resource sites and surveys occurring within the Potentially Valuable Areas (PVAs), Known Geothermal Resource Areas (KGRAs), and pending lease sites. The data were compiled from records maintained at the Winnemucca Field Office (WFO) and electronically formatted data from the Nevada State Museum (provided for this project courtesy of the Nevada State Historic Preservation Office (SHPO)). The latter, are part of an on-going project to digitize the state's cultural resources database and have not yet been subject to a quality assurance review.

The data varied greatly. Much of the WFO data provided detailed descriptions of sites but lacked information on the number of acres surveyed within a PVA, KGRA, or lease application. Conversely, the electronically formatted data from the Nevada State Museum allowed for a much better analysis of survey coverage within a PVA, KGRA, or lease application, but very limited information on sites.

The National Register of Historic Places (NRHP) Status categories indicate whether or not a property has been evaluated. Those that have been evaluated are listed as registered (i.e., the property is listed on the NRHP), eligible for NRHP listing, or not eligible. Those that have not been evaluated are listed as undetermined, potentially eligible, other, or have no information. The latter have been left blank. One other category, No Longer, is used to refer to a property that was collected when recorded. Sites in this category are counted as not eligible.

SITES AND SURVEYS BY LEASE

The following information is organized by lease application serial number. Association data on location relative to PVA/KGRA is provided in brackets.

NVN 008487 (PVANVN 13 Dixie Valley KGRA)
This lease application consists of 3 sections (Township 25N/Range 37E Section 14, Section 15, and Section 16). No cultural resources have been identified. Cultural resources inventories (no report numbers available) conducted within its boundaries encompass approximately 37 acres.

NVN 008489 (PVA 13 Dixie Valley KGRA)
This lease application consists of 2 sections (Township 25N/Range 37E Section 28 and Section 29). No cultural resources have been identified. Cultural resources inventories (no report numbers available) conducted within its boundaries encompass approximately 37 acres.

NVN 010922 (PVA 8 Brady)
This lease application consists of 1 section (Township 22N/Range 26E Section 2). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 012862 (PVA 11)
This lease application consists of 1 section (Township 32N/Range 37E Section 32). No cultural resources have been identified. One cultural resources inventory (2-2292) conducted within its boundaries encompasses approximately 36 acres.

NVN 013069 (PVA 8 Brady)
This lease application consists of 2 sections (Township 22N/Range 27E Section 16 and Section 22). No cultural resources have been identified. Cultural resources inventories (2-116, 2-240, 2-753 and 2-2239) conducted within its boundaries encompass approximately 82 acres.

NVN 013072A (PVA 8 Brady)
This lease application consists of 1 section (Township 22N/Range 27E Section 28). No cultural resources have been identified. Cultural resources inventories (2-753 and 2-2239) conducted within its boundaries encompass approximately 13 acres.

NVN 018423 (PVA 8 Brady)
This lease application consists of 1 section (Township 22N/Range 27E Section 26). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 040353 (PVA 8 Brady)
This lease application consists of 1 section (Township 23N/Range 26E Section 36). No cultural resources have been identified. Cultural resources inventories (no report numbers available) conducted within its boundaries encompass approximately .76 acres.

NVN 040355 (PVA 8 Brady)
This lease application consists of 1 section (Township 22N/Range 27E Section 6). No cultural resources have been identified. One cultural resources inventory (1-288) conducted within its boundaries encompasses approximately 2.57 acres.

NVN 042707 (PVA 8 San Emidio)
This lease application consists of 4 sections (Township 29N/Range 23E Section 16, Section 17, Section 20, and Section 21). No cultural resources have been identified. Cultural resources inventories (6-759 and at least one other with no report number available) conducted within its boundaries encompass approximately 90 acres.

NVN 046566 (PVA 8 Brady)
This lease application consists of 1 section (Township 22N/Range 26E Section 12). No cultural resources have been identified. One cultural resources inventory (2-921) conducted within its boundaries encompasses approximately 479 acres.

NVN 047353 (PVA 8 Brady)
This lease application consists of 1 section (Township 31N/Range 33E Section 16). One cultural resource, a portion of the Emigrant Trail, is known to cross it. However, it has not been identified in the field and has not been evaluated. Cultural resources inventories (2-213, 2-224, 2-2140, 2-2445, 2-2689, and 3-1215) conducted within its boundaries encompass approximately 381 acres.

NVN 048027 (PVA 9 Rye Patch)
This lease application consists of 3 sections (Township 31N/Range 33E Section 20, Section 28, and Section 32). One cultural resource, a portion of the Emigrant Trail, is known to cross it. However, it has not been identified in the field and has not been evaluated. Cultural resources inventories (2-158, 2-213, 2-782, 2-1205, 2-2140, 2-2388, 2-2434, 2-2445, 2-2742 and 3-1215), some repeated over previously surveyed areas, conducted within its boundaries encompass approximately 2079 acres.

NVN 055347 (PVA 9 Rye Patch)
This lease application consists of 1 section (Township 31N/Range 33E Section 22). No cultural resources have been identified. Cultural resources inventories (2-213, 2-381, 2-2445, and 2-2689) conducted within its boundaries encompass approximately 355 acres.

NVN 055718 (PVA 8 Gerlach)
This lease application consists of 4 sections (Township 32N/Range 23E Section 9, Section 10, Section 15, and Section 16). No cultural resources have been identified. Cultural resources inventories (no report numbers available) conducted within its boundaries encompass approximately 1594 acres.

NVN 057436 (PVA 7 W)
This lease application consists of 4 sections (Township 36N/Range 34E Section 10, Section 12, Section 22, and Section 26). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 057437 (PVA 8 San Emidio)
This lease application consists of 4 sections (Township 32N/Range 23E Section 9, Section 10, Section 15, and Section 16). Thirty-three cultural resources have been identified. One is eligible for the NRHP while three are not. The rest are undetermined or unknown. Cultural resources inventories (6-759 and at least one other with no report number available) conducted within its boundaries encompass approximately 22 acres.

Agency		**Smithsonian No.**	**Component**		**NVN 057437 Description**	**NRHP Status**
Prefix	***Number***		***Prehistoric***	***Historic***		
22	31	WA2250	x	x		Undetermined
22	33	WA1421	x	x		Undetermined
		WA2254	x			
		WA2257	x			
		WA2258	x			
		WA2271	x			
		WA2272	x			
		WA2273	x			

Agency		Smithsonian No.	Component		NVN 057437 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
		WA2277	x			
22	38	WA2255	x	x		Not eligible
22	39	WA2256	x	x		Not eligible
		WA2259	x			
22	78	WA2297	x	x		Not eligible
22	87	WA2278	x	x		Undetermined
		WA2592	x			
		WA2649	x			
		WA2669	x			
		WA2670	x			
		WA2758	x			
22	2858	WA3011	x	x		Undetermined
22	6814	WA6409	x	x		Eligible
		WA6624	x			
		WA6625	x			
		WA6626	x			
		WA6627	x			
		WA6628	x			
		WA6629	x			
		WA6630	x			
		WA6631	x			
		WA6632	x			
		WA6633	x			

Agency		Smithsonian No.	Component		NVN 057437 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
		WA6634	x			
		WA6635	x			

NVN 058196 (PVA 7 W)
This lease application consists of 1 section (Township 36N/Range 34E Section 14). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 060215 (PVA 7 E)
This lease application consists of five sections (Township 34N/Range 41E Section 4, Section 6, Section 8, Section 16, and Section 18). No cultural resources have been identified. One cultural resources inventory (2-249) was conducted within Section 4 encompassing approximately 1.44 acres. Projects within one mile of Section 4 located one biface fragment and a cabin near Sulphur Spring (Project 2-2430) and a 1900-1930s dug out cabin with spring box, stock tank, and loading chute (2-5442). Cans, glass, ceramic, metal, wire, nails, bottles, and a car were also found.

NVN 061480 (PVA 8 Brady)
This lease application consists of 2 sections (Township 22N/Range 27E Section 10 and Section 14). No cultural resources have been identified. Three cultural resources inventories (1-198, 1-267 and 2-2239) have been conducted within its boundaries encompassing approximately 32 acres.

NVN 061481 (PVA 8 Brady)
This lease application consists of 1 section (Township 22N/Range 27E Section 20). No cultural resources have been identified. One cultural resources inventory (1-198) was conducted within its boundaries encompassing approximately 20 acres.

NVN 062739 (PVA 8 Brady)
This lease application consists of 1 section (Township 22N/Range 26E Section 25). One cultural resource site has been identified. It is not eligible for the NRHP. One cultural resources inventory (2-2239) was conducted within its boundaries encompassing approximately 20 acres.

Agency		Smithsonian No.	Component		NVN 062739 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	736	CH574				Not Eligible

NVN 062741 (PVA 8 Brady)
This lease application consists of 1 section (Township 22N/Range 27E Section 30). No cultural resources have been identified. One cultural resources inventory (2-2239) was conducted within its boundaries encompassing approximately 20 acres.

NVN 063004 (PVA 8 San Emidio)
This lease application consists of 2 sections (Township 29N/Range 23E Section 15 and Section 22). Five cultural resources have been identified. One is undetermined and the NRHP status for the rest is unknown. Twelve cultural resources inventories (6-759, 2-2139 and NSM numbers 16-71, 16-72, 16-74, 16-144, 16-319, 16-348, 16-565, 16-566, 16-568, 16-574) were conducted within its boundaries encompassing approximately 220 acres.

Agency		Smithsonian No.	Component		NVN 063004 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	387	WA2089				Undetermined
		WA3800				
		WA3364				
		WA3365				
		WA3778				

NVN 063005 (PVA 8 San Emidio)
This lease application consists of 2 sections (Township 29N/Range 23E Section 3 and Section 10). No cultural resources have been identified. Nine cultural resources inventories (6-759 and NSM numbers 16-72, 16-144, 16-348, 16-362, 16-461, 16-566, 16-568, 16-574) were conducted within its boundaries encompassing approximately 184 acres.

NVN 063006 (PVA 8 San Emidio)
This lease application consists of 3 sections (Township 29N/Range 23E Section 32, Section 33, and Section 34). Three cultural resources have been identified. Two are determined not eligible for the NRHP. The status for the other one is unknown. Three

cultural resources inventories (NSM numbers 16-71, 16-144, 16-566) were conducted within its boundaries encompassing approximately 43 acres.

Agency		Smithsonian No.	Component		NVN 063006 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	1211	WA3133				Not Eligible
22	1213	WA3132				Not Eligible
		WA3368				

NVN 063007 (PVA 8 San Emidio)
This lease application consists of 3 sections (Township 29N/Range 23E Section 27, Section 28, and Section 29). Four cultural resources have been identified. One is determined not eligible for the NRHP. The status for the others is unknown. Five cultural resources inventories (NSM numbers 16-71, 16-144, 16-319, 16-390, 16-566) were conducted within its boundaries encompassing approximately 40 acres.

Agency		Smithsonian No.	Component		NVN 063007 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	1211	WA3133				Not Eligible
		WA3366				
		WA3368				
		WA3777				

NVN 065558 (PVA 8 Brady)
This lease application consists of 2 sections (Township 22N/Range 26E Section 14 and Section 24). Two cultural resources have been identified. The NRHP status for one is undetermined; the other is not eligible. Four cultural resources inventories (2-921 and 2-753, NSM numbers 1-265, 18-127) were conducted within its boundaries encompassing approximately 73 acres.

Agency		Smithsonian No.	Component		NVN 065558 Description	NRHP Status
Prefix	Number		Prehistoric	Historic		
22	135	CH315				Undetermined
22	2754	CH1074				Not Eligible

NVN 065655 (PVA 8 Gerlach)
This lease application consists of 3 sections (Township 33N/Range 23E Section 3, Section 11, and Section 12). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 066270 (PVA 8 Gerlach)
This lease application consists of one section (Township 34N/Range 26E Section 31). It has 25 cultural resources identified. Six are eligible for the NRHP. Three of these (22-881, 22-882, and 22-883) are actually components of a larger site (22-880) that encircles Trego Hot Springs. The remainder are undetermined. One cultural resources inventory (2-2263) was conducted encompassing approximately 22 acres.

Agency		Smithsonian No.	Component		NVN 066270 Description	NRHP Status
Prefix	Number		Prehistoric	Historic		
22	95		x		Three flakes.	
22	872			x	One horseshoe.	
22	873	PE613	x		One jasper flake.	
22	874		x		Lithic scatter, ca. 100 obsidian flakes.	
22	875		x		Lithic scatter ca. 20 obsidian flakes.	
22	876		x		Lithic scatter ca. 15 jasper, chert and obsidian flakes.	
22	877		x		Lithic scatter, jasper and obsidian flakes.	
22	878		x		20 chert and jasper flakes.	
22	879		x		Sparse lithic scatter.	

Agency		Smithsonian No.	Component		NVN 066270 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	880		x	x	Extensive lithic site encompassing 881, 882, and 883. A historic structure made of railroad ties dug into a dune was present.	Eligible
22	881	PE118	x	x	Dense lithic concentration and a historic dugout structure with bottles, tin cans, scrap wood and metal.	Eligible
22	882	PE622	x	x	Dense lithic concentration – depth to at least 30 cm; metate fragments; burnt bone; signs of railroad activities.	Eligible
22	883	PE623	x	x	Dense lithic concentration – metate fragment; proj. point tip, biface; road parallel to railroad tracks cuts through.	Eligible
22	893		x		20 obsidian , jasper, and chert flakes, one knife fragment. Small scatter of obsidian, chert, and chalcedony flakes.	
22	894		x		One jasper and one chert flake.	
22	895	PE635		x	Historic mining site, habitation, loading platform, metal and glass container fragments, and basalt and chert flakes.	
22	896	PE636		x	Lithic scatter of obsidian, chert, jasper, and basalt flakes.	
22	917	PE645	x		One awl tip and a mid-section of an artifact. Both of chert.	
22	918	PE646	x		Lithic scatter of obsidian, basalt, red jasper, and chert. No tools noted.	
22	919	PE647	x		Flakes of chert, orange jasper, obsidian, and basalt.	

Agency		Smithsonian No.	Component		NVN 066270 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	920	PE648	x		Flakes of chert, jasper, obsidian, basalt, and chalcedony along with basalt cores.	
22	2194		x		Prehistoric habitation site, 3 distinct occupational horizons, house floors, and a possible well. Radiocarboned at 4000-1000 BP; 8 bifaces, 1 tule knife, 1 drill, 1 flake tool, 2 handstones, 3 milling slabs, shell, organic remains, burned stone, ground stone, charcoal.	Eligible
22	4601	PE2249	x		A brown and white chert biface thinning flake.	
22	4602	PE2250	x		Three secondary flakes, one jasper and two chert.	
22	4665			x	Nobles cut–off trail	Eligible

NVN 066271 (W of PVA 4)

This lease application consists of one section (Township 37N/Range 26E Section 28). It has 4 cultural resources identified. One is eligible for the NRHP (22-822)—the Applegate-Lassen Trail. One cultural resources inventory (2-331) was conducted—it is unknown how many acres it encompassed.

Agency		Smithsonian No.	Component		NVN 066271 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	822		x		Applegate-Lassen Trail.	Eligible
22	1134	HU1176	x		Utilized jasper nodules, obsidian pebbles and chert. One large biface fragment.	Not eligible
22	1727		x		Dense lithic scatter, large flakes of CCS, bifaces, chopper, utilized flake, and manos were found.	

Agency		Smithsonian No.	Component		NVN 066271 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	1728		x		Lithic scatter with possible mano.	

NVN 066272 (W of PVA 3)

This lease application consists of one section (Township 40N/Range 24E Section 13). It has 3 cultural resources identified. One is eligible for the NRHP (22-208)—an abundance of ground stone and artifacts. One is undetermined. Two cultural resources inventories (2-60 and 2-2779) were conducted—it is unknown how many acres they encompassed. Antiquities Observations in the area include:

- AO- 202- Flakes and broken metate.
- AO- 354- Caves that have been pot-hunted. Back-dirt yielded choppers, scrapers, flakes, and hand axes of basalt.
- AO- 355 & 356- Dense scatter of chert, basalt, obsidian, and chalcedony. Artifacts range from domed scrapers, choppers, hand axes, utilized flakes, and projectile points, ground stone.
- AO- 359- Series of localized hunting sites. Notes that near every spring and meadows is chipping area.
- AO- 360- Locales of chipping with a lot of debitage around Soldier Springs.
- AO- 361- Assay stations, manufacturing stations, flaking stations, and isolated artifacts.
- AO- 364- Scatter of obsidian, one large paleo chopper, scaper, obsidian core, primary flakes.
- AO- 367- Potted caves, flakes, chalcedony, chert, obsidian, projectile points.

Agency		Smithsonian No.	Component		NVN 066272 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	207		x		Basalt cores, chipped stone.	
22	208		x		Abundance of ground stone and artifacts.	Eligible
		HU1032	x			Undetermined

NVN 066403 (PVA 8 Gerlach)

This lease application consists of portions of three sections (Township 34N/Range 23E Section 25 E2E2, Section 34 W2E2, W2, Lots 1-4 and Section 36 NENE, S2NE, SE, E2SW). It has 46 cultural resources identified (all in Section 34). One is eligible for the NRHP (22-2450); one no longer exists; one is undetermined and the rest are unknown. It should be noted that within a one-mile radius of Section 34 is the Granite Creek Petroglyph Site (AR-27-02-2 or 26WA2238). At least one cultural resources inventory (number not available) was conducted encompassing approximately 1294 acres.

Agency		Smithsonian No.	Component		NVN 066403 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	2	WA2238	x	x		Undetermined
22	2410		x		Obsidian flake	
22	2411		x		Jasper flake and obsidian flake.	
22	2412		x		Chunk of white chert.	
22	2413		x		Grey chert Desert Side-Notched projectile point.	
22	2414		x		Two Elko Eared obsidian projectile points.	
22	2415		x		Obsidian flake.	
22	2416		x		White chert biface tip.	
22	2417		x		One Obsidian Pinto projectile point.	
22	2418		x		One obsidian flake.	
22	2419	WA2940	x		Quartzite flake.	
22	2420	WA2941	x		White chert flake.	
22	2421	WA2942	x		3 obsidian flakes.	
22	2422	WA2943	x		One chert flake and one obsidian flake.	
22	2423	WA2944	x		2 obsidian flakes.	
22	2424	WA2945	x		5 obsidian flakes.	
22	2425	WA2946	x		7 obsidian and one basalt flake.	
22	2426	WA2947	x		Basalt core, 4 obsidian flakes, and 2 basalt flakes.	
22	2427	WA2948	x		Two obsidian flakes.	No Longer

Agency		Smithsonian No.	Component		NVN 066403 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	2428	WA2949	x		Two obsidian flakes.	
22	2429		x		White chert projectile point midsection.	
22	2430		x		Obsidian projectile point midsection.	
22	2431		x		Obsidian nodule frag.	
22	2432		x		Stone cairn.	
22	2433		x		Stone Cairn.	
22	2434		x		Two Rose Spring Series, 1 maris side notched, one humoldt concave base, 3 knife frags, drill, flakes, and a basalt core.	
22	2435		x		Projectile point frag. And obsidian flake.	
22	2436		x		3 projectile points, flakes, metates.	
22	2437		x		Lithic scatter.	
22	2438		x		One Eastgate series, biface, basalt core.	
22	2439		x		3 projectile points, flakes, basalt chopper, 3 tule knives.	
22	2440		x		Rock wall, lithic scatter, chert core, 3 utilized flakes.	
22	2441		x		Difuse lithic scatter of scraper type utilized flakes.	
22	2442		x		Lithic scatter and projectile point frag.	
22	2443		x		Lithic scatter, projectile point frags.	
22	2444		x		Hunting blind, small pit about 1.5 meters by 1 meter in size	
22	2445		x		Obsidian bifaces, utilized flake, basalt chopper, metate, mano.	

Agency		Smithsonian No.	Component		NVN 066403 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	2446		x		One DSN and one Elko corner notched, obsidian biface, chert biface, unitlized flakes, basalt core.	
22	2447		x		One Pinto point, knife frags, unifacial chert scraper, chert core, utilized flakes, mano.	
22	2448		x		Projectile point, drill, jasper core, 2 quartz flakes.	
22	2449		x		One Rose spring projectile point, utilized flakes, some below surface.	
22	2450		x		Projectile point, bifaces, scaper, unitlized flake, basalt core, metates, mano, pestle frag., FCR, bone, and a midden deposit.	Eligible
22	2451		x		Projectile point, modified flakes, basalt hammerstone.	
22	2452		x		Biface frags, utilized flakes, some flakes under surface.	
22	2453		x		One Rose Spring Series, Dart point frags, chert untilized flakes, metate. Flakes below surface.	
22	2454		x		One Rose Spring Series, scraper, mano.	

NVN 066404 (PVA 8 Gerlach)

This lease application consists of portions of five sections (Township 33N/Range 23E Section 1 S2N2,S2 Lots 1-4, Section 2 S2N2, N2S2, NESW, S2SE Lots 3,4, Section 26 NW, N2SW, SWSW, Section 27 W2E2, W2 Lots 1-4 and Section 35 W2NW, NWSW). It has 5 cultural resources identified. One is eligible for the NRHP (22-229) – Granite Creek Station, a stopping point on the California trail. Camp Mckee, a temporary military tent camp existed here for one year. Rock foundations are still in existence. It should be noted that within a one-mile radius of Section 2 is the Granite Creek Petroglyph Site (AR-27-02-2 or 26WA2238). Two cultural resources inventories (2-23 and 2-32) were conducted – at least 7.5 acres were surveyed.

Agency		Smithsonian No.	Component		NVN 066404 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	32	WA2249	x		One chopper, several obsidian flakes, obsidian projectile point, mano, and a FCR frag	
22	34	WA2251	x		Obsidian projectile point.	No longer
22	35	WA2252	x		One Desert Side Notch projectile point.	No longer
22	36	WA2253	x		One small obsidian projectile point.	
22	229	WA2327		x	Granite Creek Station	Eligible

NVN 065740

This lease application consists of 4 sections (Township 31N/Range 33E Section 13, Section 24, Section 25, and Section 26). Nineteen cultural resources have been identified. Five are NRHP eligible; thirteen are not eligible. One is listed as "Other" and is considered undetermined. One cultural resources inventory (2-2689) has been conducted within its boundaries encompassing approximately 510 acres.

Agency		Smithsonian No.	Component		NVN 065740 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22		PE2097				Other
22		PE2098				Not Eligible
22	6303					Not Eligible
22	6306					Not Eligible
22	6307					Eligible
22	6308					Eligible
22	6309					Not Eligible
22	6310					Not Eligible
22	6311					Not Eligible

Agency		Smithsonian No.	Component		NVN 065740 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	6322					Not Eligible
22	6323					Eligible
22	6324					Not Eligible
22	6325					Not Eligible
22	6333					Not Eligible
22	6334					Not Eligible
22	6335					Eligible
22	6336					Not Eligible
22	6337					Eligible
22	6343					Not Eligible

NVN 066741 (PVA 9 Rye Patch)
This lease application consists of two sections (Township 32N/Range 33E Section 26 and Section 36). No cultural resources have been identified. Six cultural resources inventories (2-332, 2-266, 2-992, 2-2140, 2-2689, and 3-1215) were conducted encompassing approximately 43 acres.

NVN 066742 (PVA 12 NY Canyon S)
This lease application consists of 1 section (Township 25N/Range 35E Section 13). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 066743 (PVA 12 NY Canyon S)
This lease application consists of 2 sections (Township 25N/Range 36E Section 7 and Section 18). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 073698 (PVA 10)

This lease application consists of two sections (Township 32N/Range 33E Section 26 and Section 36). No cultural resources have been identified. Seven cultural resources inventories (2-95, 2-107, 2-139, 2-145, 2-808, 2-809, and 2-2628) were conducted encompassing approximately 65 acres.

NVN 074196 (PVA 8 San Emidio)

This lease application consists of one section (Township 30N/Range 23E Section 33). It has three cultural resources identified. It should be noted that the entire area is part of the Lake Range Quarries National Register District. Six cultural resources inventories (2-197, 2-245, 2-765, 2-1021, 2-2235, and 2-2697) were conducted – at least 7.5 acres were surveyed.

Agency		**Smithsonian No.**	**Component**		**NVN 074196 Description**	**NRHP Status**
Prefix	***Number***		***Prehistoric***	***Historic***		
22	1126		x		Chert scraper	No longer
22	1211	WA3133	x		Quarry site; CCS material, flakes, cores, bifaces.	Eligible
22	4181	WA3743	x	x		Eligible

NVN 074233 (PVA 11)

This lease application consists of one section (Township 31N/Range 39E Section 27). No cultural resources have been identified. Seven cultural resources inventories (2-25, 2-31, 2-77, 2-94, 2-252, 2-375, and 2-379) were conducted encompassing at least 14 acres.

NVN 074246 (PVA 9 Rye Patch S)

This lease application consists of one section (Township 28N/Range 32E Section 36). No cultural resources have been identified. One cultural resources inventory (2-2284) was conducted encompassing approximately 390 acres.

NVN 074247 (PVA 9 Rye Patch S)

This lease application consists of four sections (Township 27N/Range 32E Section 2, Section 10, Section 12, and Section 14). It has five cultural resources identified. One of these was collected when recorded; two are undetermined; and two are unknown. It should be noted that within a one-mile radius of Section 2 is the old mining town called Willard. All that remains is a cabin that looks recently lived in, modern trash and historic trash of cans, glass, and ceramic. Also, in Sections 2 and 12, Antiquities Observation 283 includes a rock shelter, a small rock alignment, and 2 jasper flakes. Eight cultural resources inventories (2-61, 2-266, 2-507, 2-508, 2-702, 2-2056, 2-2193, and 2-2362) were conducted encompassing approximately 1,267 acres.

Agency		Smithsonian No.	Component		NVN 074247 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	2623	PE897	x		32 Rhyolite flakes.	
22	2626	PE2023		x	A hole-in-cap, soldered-seam tin can, and purple glass pumpkin seed bottle fragment.	Undetermined
22	4611	PE1044	x		One humboldt concave base projectile point of obsidian.	No Longer
22	5011	PE2241	x		20 primary and secondary flakes of CCS.	Undetermined
22	3675		x		One rhyolite scraper.	

NVN 074248 (PVA 9 Rye Patch S)

This lease application consists of one section (Township 31N/Range 39E Section 27). No cultural resources have been identified. Three cultural resources inventories (2-689, 2-775 and 2-2295) were conducted encompassing at least 14 acres.

NVN 074276 (PVA 11)

This lease application consists of four sections (Township 32N/Range 38E Section 25 and Section 36 and Township 32N/Range 39E Section 30 and Section 31). It has 2 cultural resources identified. One of these is undetermined (22-2253); the other is not eligible (22-6658). Fourteen cultural resources inventories (2-6, 2-72, 2-83, 2-143, 2-252, 2-333, 2-338, 2-348, 2-375, 2-379, 2-388, 2-393, 2-992, and 2-2704) were conducted encompassing approximately 90 acres.

Agency		Smithsonian No.	Component		NVN 074276 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	2253	PE730	x	x	Debitage, bifaces, utilized flakes, projectile points, scrapers, core fragments, mano, metate, of chert, obsidian, and CCS. Historic component is present. A historic telegraph line runs through the site, 3 glass sherds and several tin can fragments.	Undetermined
22	6658		x		Historic road from Grass Valley to Austin.	Not eligible

NVN 074299 (PVA 11)
This lease application consists of 3 sections (Township 31N/Range 39E Section 21, Section 22, and Section 28). No cultural resources have been identified. Eight cultural resources inventories (2-25, 2-31, 2-72, 2-77, 2-87, 2-94, 2-252, 2-338) have been conducted within its boundaries encompassing approximately 112 acres.

NVN 074300 (PVA 3)
This lease application consists of 2 sections (Township 40N/Range 28E Section 16 and Section 21). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 074301 (PVA 3)
This lease application consists of 4 sections (Township 40N/Range 28E Section 17, Section 18, Section 19, and Section 20). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 074302 (PVA 8 Brady)
This lease application consists of 4 sections (Township 25N/Range 25E Section 28, Section 30, Section 32, and Section 36). Three cultural resources have been identified. One was collected in the field and no longer exists. The NRHP status of the others is undetermined. Eight cultural resources inventories (2-83, 2-348, 2-499, NSM 18-16) have been conducted within its boundaries encompassing approximately 112 acres.

Agency		Smithsonian No.	Component		NVN 074302 Description	NRHP Status
Prefix	Number		Prehistoric	Historic		
22	1167	CH468				Undetermined
22	1170	CH181				Undetermined
22	2219	CH599				No Longer

NVN 074303 (PVA 8 Brady)

This lease application consists of 2 sections (Township 23N/Range 36E Section 5 and Section 6). One cultural resource has been identified; its NRHP status is undetermined. Five cultural resources inventories (2-83, 2-348, 2-964, NSM 18-16, 18-242) have been conducted within its boundaries encompassing approximately 47 acres.

Agency		Smithsonian No.	Component		NVN 074303 Description	NRHP Status
Prefix	Number		Prehistoric	Historic		
22	1172	CH184				Undetermined

NVN 074305 (PVA 1 N)

This lease application consists of two sections and a portion of a third (Township 46N/Range 28E Section 11, Section 14 and Section 13 NE, N2NW, S2). It has 10 cultural resources identified. Eight are undetermined; two are not eligible. One NRHP eligible property is located within a mile (2-2592). It has numerous obsidian flakes, an obsidian rose spring corner-notched projectile point (collected), a biface top and a projectile point. Subsurface material is probable. Fourteen cultural resources inventories (2-132, 2-190, 2-191, 2-264, 2-337, 2-356, 2-419, 2-486, 2-264, 2-1275, 2-2040, 2-2155, 2-2161, and 2-2229) were conducted encompassing at least 105 acres.

Agency		Smithsonian No.	Component		NVN 074305 Description	NRHP Status
Prefix	Number		Prehistoric	Historic		
21	1015	HU1135	x		Obsidian flakes and cores, some chert flakes.	Not eligible
21	2224	HU2235	x		Flakes of obsidian and chert.	Not eligible
21	2389	HU2205	x		Tin can.	Undetermined

Agency		Smithsonian No.	Component		NVN 074305 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
21	2390	HU2206	x		Chert flake.	Undetermined
21	2391	HU2207	x	x	Lithic scatter of chert obsidian and basalt, flakes, bifaces, grinding stones.	Undetermined
21	2392	HU2208		x	Bottle fragments.	Undetermined
21	2393	HU2209	x		Rosespring projectile point.	
21	2394	HU2210	x		Three historic structures and a lithic scatter of obsidian debitage.	Undetermined
21	2395	HU2211	x		Lithic scatter of obsidian flakes.	Undetermined
21	2397	HU2213	x		Stone cairn.	Undetermined

NVN 074306 (PVA 1 N)

This lease application consists of portions of four sections (Township 46N/Range 28E Section 1 S2, Lots1-12 and Section 12 and Township 47N/Range 29E Section 13 E2W2, E2, Lots1-4 and Section 24 E2W2, E2, Lots1-4). It has 6 cultural resources identified. One of these is eligible (21-2592). Nine cultural resources inventories (2-115, 2-132, 2-356, 2-419, 2-486, 2-911, 2-1275, 2-2073, and 2-2161) were conducted encompassing at least 84 acres. Two NRHP eligible properties are located within a mile of this lease application. One is numbered 21-2394 (26HU2210) and consists of three historic structures and a lithic scatter of obsidian debitage. The other is numbered 21-2395 (26HU2211) and consists of a lithic artifact scatter of obsidian flakes.

Agency		Smithsonian No.	Component		NVN 074306 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
21	2222	HU2234	x		One obsidian knife tip.	No Longer
21	2223		x		One obsidian flake.	
21	2225		x		Six obsidian flakes.	
21	2396	HU2212	x		Utilized chert flake.	Undetermined

Agency		Smithsonian No.	Component		NVN 074306 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
21	2592	HU1240			Numerous obsidian flakes, obsidian rose spring corner-notched projectile point (collected), a biface top and projectile point. Subsurface material is probable.	Eligible
21	3644			x	A broken purple whiskey bottle.	

NVN 074308 (PVA 1 S)
This lease application consists of two sections (Township 45N/Range 27E Section 22 and Section 23). No cultural resources have been identified. Two cultural resources inventories (2-161 and 2-2114) were conducted encompassing approximately 5 acres.

NVN 074309 (PVA 1 S)
This lease application consists of four sections (Township 45N/Range 27E Section 26, Section 27, Section 34, and Section 35). No cultural resources have been identified. Five cultural resources inventories (2-132, 2-142, 2-161, 2-264, and 2-280) were conducted encompassing approximately 34 acres.

NVN 074475 (PVA 1 S)
This lease application consists of two sections and a portion of a third (Township 44N/Range 27E Section 1, Section 14, and Section 12 N2, N2SW, SESW, SE lots 1-14). It has 22 cultural resources identified; none are eligible to the NRHP. However, the NRHPS status for at least one is undetermined and ten are not known. Eight cultural resources inventories (2-79, 2-142, 2-519, 2-560, 2-1048, 2-2177, 2-2423, 2-2529) were conducted encompassing at least 417 acres.

Agency		Smithsonian No.	Component		NVN 074475 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
21	409	HU866	x		Jasper obsidian, and chert flakes 2 obsidian projectile point basal fragments.	Not eligible
21	410	HU867	x		Basalt unifaces, 2 obsidian Elko eared basal points and 1 biface.	No Longer
21	411	HU868	x		Jasper chert, basalt, and obsidian observed.	

Agency		Smithsonian No.	Component		NVN 074475 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
	412				Obsidian, jasper, and one obsidian medial point fragment.	
21	413	HU870	x		One uniface basalt scraper, one mano, one metate, and 2 obsidian projectile point frags.	No Longer
21	414	HU871	x		One obsidian projectile point.	No Longer
21	415	HU872	x			Not eligible
21	2632	HU1379	x			Not eligible
21	2633	HU1380	x	x		Not eligible
21	2637	HU1384	x			Not eligible
21	2638	HU1385	x			Not eligible
21	2639	HU1386	x			Not eligible
21	2657	HU1378	x			Not eligible
21	2663	HU1562	x		Obsidian lithic scatter and manos, metates, basalt choppers, projectile point fragments.	Undetermined
21	2686	HU1563	x		Obsidian flake.	
21	3375		x		One utilized obsidian flake.	
21	3376		x		3 obsidian flakes, 2 basalt flakes.	
21	3377		x		One obsidian flake.	
21	3378		x		2 basalt flakes.	
21	3379		x		One broken possible Rose Spring/Eastgate obsidian point.	
21	3380		x		One broken possible Elko point.	
21	3381		x		One obsidian biface.	

NVN 074476 (PVA 1 N)
This lease application consists of four sections (Township 47N/Range 30E Section 18, Township 46N/Range 28E Section 24 and Section 26, and Township 47N/Range 29E Section 25). One cultural resource site has been identified (21-2592) and is NRHP eligible. Five cultural resources inventories (2-132, 2-264, 2-356, 2-486, and 2-1275) were conducted encompassing approximately 646 acres. Sites within a mile include a concentration of obsidian flakes with the possibility of subsurface materials (2-1016). It has been referred to as a possible seasonal base camp. Rock shelters with obsidian flakes on the slope below (2-2398) have also been observed.

Agency		**Smithsonian No.**	**Component**		**NVN 074476 Description**	**NRHP Status**
Prefix	***Number***		***Prehistoric***	***Historic***		
21	2592	HU1240	x		Numerous obsidian flakes, obsidian rose spring corner-notched projectile point (collected), a biface top and projectile point. Subsurface material is probable.	Eligible

NVN 074477 (PVA 1 S)
This lease application consists of 1 section (Township 45N/Range 27E Section 14). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 074541 (PVA 9 Rye Patch)
This lease application consists of 1 section (Township 32N/Range 33E Section 25). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 074578 (PVA 8 Gerlach)
This lease application consists of portions of two sections (Township 34N/Range 23E Section 13 E2E2W2 and Section 24 NE, SENW, N2SE, SESE). No cultural resources have been identified. One cultural resources inventory (2-99) was conducted; it is unknown how many acres it encompassed.

NVN 074579 (PVA 8 Gerlach)

This lease application consists of three sections and a portion of a fourth (Township 34N/Range 23E Section 15, Section 22, Section 23, and Section 14 W2). Three cultural resources have been identified; one is NRHP eligible. Two cultural resources inventories (2-433 and 2-2792) were conducted encompassing at least 78 acres.

Agency		Smithsonian No.	Component		NVN 074579 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	2409	WA2930	x		One Martis Contracting Stem white chert projectile point.	No Longer
22	2427	WA2948	x			Not eligible
22	7153		x		Dispersed scatter of debitage, two Rose Spring Corner-Notched projectile points one of chert one of obsidian, one obsidian biface fragment, 4 flakes.	Eligible

NVN 074580 (PVA 8 Gerlach)

This lease application consists of 6 sections (Township 34N/Range 23E Section 1, Section 2, Section 3, Section 10, Section 11, and Section 12). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 074656 (PVA 6)

This lease application consists of one section and portions of three others (Township 41N/Range 41E Section 19 S2NW, S2, Section 20 NE, N2NW, NESE, S2SW, Section 21 N2, N2S2, and Section 22). Ten cultural resources have been identified; one is not NRHP eligible. The NRHP status of the others is unknown. Four cultural resources inventories (2-194, 2-1275, 2-2018, and 2-2176) were conducted encompassing at least 34 acres.

Agency		Smithsonian No.	Component		NVN 074656 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
21	1034	HU851	x		Lithic scatter with agate and chalcedony flakes, 4 chert and obsidian cores, and 2 chert and obsidian bifaces.	
21	1035	HU852	x		Lithic scatter of obsidian and jasper. Quarrying of the jasper.	Not eligible
		HU1865	x	x		
21	3576	HU2819	x		Several obsidian flakes.	
21	3579		x		Sparse lithic scatter mostly of the native obsidian, some chert, and a mano.	
21	3999	HU1860	x		Too fragment.	
21	4000	HU1861	x		9 Flakes, one point tip.	
21	4001	HU1862	x		5 flakes.	
21	4002	HU1863	x		One flake.	
21	4003	HU1854	x		A CCS possible scraper.	

NVN 074765 (PVA 7 W)

This lease application consists of one section (Township 36N/Range 34E Section 14). No cultural resources have been identified. Two cultural resources inventories (2-1404 and 2-1424) were conducted; it is unknown how many acres they encompassed.

NVN 074853 (PVA 7 N)

This lease application consists of one section (Township 37N/Range 39E Section 4). It has 2 cultural resources identified; neither are NRHP eligible. Two cultural resources inventories (2-601 and 2-877) were conducted encompassing 617 acres.

Agency		Smithsonian No.	Component		NVN 074853 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
21	3098	HU2620	x	x		Not eligible
21	3099	HU2621	x			Not eligible

NVN 074854 (PVA 12 NY Canyon N)
This lease application consists of one section (Township 26N/Range 35E Section 35). No cultural resources have been identified. Four cultural resources inventories (2-330, 2-346, 2-2230, and 3-1200) were conducted encompassing at least 18 acres.

NVN 074855 (PVA 7 S)
This lease application consists of one section and a portion of another (Township 33N/Range 40E Section 4 N2, and Section 8). It has 1 cultural resource site identified. Two cultural resources inventories (2-110 and 2-249) were conducted – at least 8 acres were surveyed.

Agency		Smithsonian No.	Component		NVN 074855 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
21	612	HU864	x		Small obsidian thinning flake.	

NVN 074870 (PVA 13 N)
This lease application consists of 1 section (Township 30N/Range 41E Section 29). No cultural resources have been identified. No cultural resources inventories have been conducted within its boundaries.

NVN 074871 (PVA 8 Brady)
This lease application consists of one section and portions of three others (Township 22N/Range 28E Section 4 Lots 5-6, Section 6, Section 7 S2N2, S2, and Section 8 SENE, E2SW Lots 1-7). Eight cultural resources have been identified; one is NRHP eligible. The NRHP status for one is undetermined. Four were collected in the field and no longer exist. Two are not eligible for the NRHP. Five cultural resources inventories (2-59, 2-307, 2-741, 2-2239, and 2-2418) were conducted encompassing at least 2064 acres.

Agency		Smithsonian No.	Component		NVN 074871 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	199	CH341	x		Obsidian flake.	No Longer
22	200	CH342	x		Flake.	No Longer
22	201	CH343	x		Obsidian projectile point possibly a Pinto Barbed. Collected	No Longer
22	202	CH344	x		Obsidian flake.	Not eligible
22	203	CH345	x		Chert core.	Not eligible
22	204	CH346	x		Basalt flake.	No Longer
22	240	CH337		x	Desert Queen Mine. Remains of many buildings and foundations still exist.	Eligible
22	2182	CH902		x	Fallon Eagle Mine. It is newer than the Desert Queen Mine. There are numerous shallow shafts.	Undetermined

NVN 074872 (PVA 8 Brady)

This lease application consists of two sections and a portion of a third (Township 22N/Range 28E Section 10, Section 16, and Section 18 E2W2, E2 Lots 1-4). Three cultural resources have been identified; all were collected in the field. Three cultural resources inventories (2-59, 2-741, and 2-2418) were conducted encompassing at least 1,247 acres.

Agency		Smithsonian No.	Component		NVN 074872 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	196	CH338	x		Obsidian flake.	No Longer
22	197	CH339	x		Chert flake.	No Longer
22	198	CH340	x		Obsidian flake.	No Longer

NVN 074873 (PVA 8 Brady)

This lease application consists of three sections and a portion of another (Township 22N/Range 28E Section 14, Section 20, Section 22, and Section 2 S2N2, S2 Lots 1-4). Seven cultural resources have been identified. The NRHP status of one is unknown; three are determined not eligible and three no longer exist. Five cultural resources inventories (2-59, 2-164, 2-741, 2-2176, and 2-2239) were conducted encompassing at least 1304 acres.

Agency		Smithsonian No.	Component		NVN 074873 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	854	CH522	x		Small jasper core, 6 flakes of chert and jasper, and One tongue shaped projectile point base.	Not eligible
22	862	CH530	x		Obsidian point in the Elko series within site 864.	No Longer
22	863	CH531	x	x	Lithic scatter of 864. A Humbolt projectile point, several cores, and a flake. A hearth with a round nail in the middle.	Not eligible
22	864	CH529	x	x	Area with flakes and artifacts. Possible historic hearth, square nail, sherds of china, prospectors pit, flakes of obsidian, chert, jasper, and chalcedony.	Not eligible
22	865		x		Seven flakes of chert and jasper.	No Longer
22	866		x		One jasper flake.	No Longer
22	867			x	Bottles with tooled lips, remnants of stone walls, remains of wooden buildings, 3 earthen tanks, and a scatter of trash.	

NVN 074881 (PVA 13 S)

This lease application consists of two sections (Township 27N/Range 40E Section 29 and Section 30). Three cultural resources have been identified. The NRHP status is not known. One cultural resources inventory (2-344) was conducted encompassing at least 2.5 acres.

Agency		Smithsonian No.	Component		NVN 074881 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
6	7	PE462	x			
22	1794	PE385	x			
		PE731	x			

NVN 074883 (PVA 13 S)

This lease application consists of one section and a portion of another (Township 27N/Range 40E Section 32 and Section 33 N2, SW, NWSE, S2SE). No cultural resources have been identified, although, Jersey City (22-465)**,** an abandoned silver camp inhabited from 1874-1877, is within a mile. A few rock ruins are present. Six cultural resources inventories (2-151, 2-214, 2-325, 2-344, 2-383, and 2-512) were conducted encompassing at least 28 acres.

NVN 074902 (PVA 9 Rye Patch S)

This lease application consists of one portion of a section (Township 28N/Range 32E Section 26 W2). One cultural resource site has been identified. Four cultural resources inventories (2-4, 2-266, 2-309, and 2-2284) were conducted encompassing at least 9 acres. In addition, this lease application is located within one mile of the Emigrant Trail.

Agency		Smithsonian No.	Component		NVN 074902 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	1884	PE354		x	Abandoned powerline, 3 different types of insulators.	No Longer

NVN 074903 (PVA 7 W)

This lease application consists of two sections and a portion of another (Township 34N/Range 36E Section 8 and Township 35N/Range 36E Section 28 and Section 32 SE). No cultural resources have been identified. Four cultural resources inventories (2-503, 2-924, 2-2140, and 3-1215) were conducted encompassing approximately 37 acres.

NVN 074905 (PVA 1 E)
This lease application consists of one section (Township 45N/Range 28E Section 25). No cultural resources have been identified. One cultural resources inventory (no number available) was conducted encompassing approximately 641 acres.

NVN 074913 (PVA 8 Brady)
This lease application consists of four sections (Township 23N/Range 24E Section 10, Section 12; and Section 14 and Township 23N/Range 25E Section 32). One cultural resource site has been identified. Five cultural resources inventories (2-802, 2-821, 2-848, 2-2600, and 2-2641) were conducted encompassing at least 33 acres.

Agency		Smithsonian No.	Component		NVN 074913 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	3120		x		One basalt biface.	

NVN 074914 (PVA 8 Brady)
This lease application consists of a section and portions of two others (Township 23N/Range 24E Section 2 S2N2, S2 Lots 1-4 and E2E2NW, W2NWNE, SWNE, and Township 23N/Range 25E Section 6 S2N2, S2 Lots 1-14 and Township 24N/Range 24E Section 36). No cultural resources have been identified. Seven cultural resources inventories (2-221, 2-802, 2-848, 2-851, 2-910, 2-2600, and 2-2641) were conducted encompassing at least 38 acres.

NVN 075228 (PVA 8 Gerlach)
This lease application consists of three sections (Township 32N/Range 23E Section 2, Section 3, and Section 4). No cultural resources have been identified. One cultural resources inventory (number unknown) was conducted encompassing approximately 12 acres.

NVN 075229 (PVA 9 Rye Patch)
This lease application consists of three sections (Township 31N/Range 33E Section 1, Section 2, and Section 12). Twenty cultural resources have been identified. Two are NRHP eligible, two are not and the rest are unknown. Six cultural resources inventory (2-865, 2-991, 2-1035, 2-2442, 2-2524, and 2-2689) were conducted encompassing approximately 1,777 acres.

Agency		Smithsonian No.	Component		NVN 075229 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
		PE2265				
		PE2266				
		PE579				
22	3069	PE2037				Eligible
		PE2259				
22	5618					
22	5621					
22	5622					
22	6312					
22	6313					Not eligible
22	6314					Not eligible
22	6337					Eligible
22	6338					
22	6339					
22	6340					
22	6341					
22	6342					
22	6344					
22	6345					
22	6347					

NVN 075230 (PVA 9 Rye Patch)
This lease application consists of three sections (Township 31N/Range 33E Section 1, Section 2 and, Section 12). Nineteen cultural resources have been identified. Four are NRHP eligible and the rest are unknown. Nine cultural resources inventory (2-103, 2-213, 2-1035, 2-1205, 2-2140, 2-2442, 2-2665, 2-2689, and 3-1215) were conducted encompassing approximately 1,400 acres.

Agency		**Smithsonian No.**	**Component**		**NVN 075230 Description**	**NRHP Status**
Prefix	***Number***		***Prehistoric***	***Historic***		
21	6136					Eligible
21	6137					Eligible
21	6138					
					CP/SP RR	
					Emigrant Trails	
					Emigrant Trails	
22	6346					
		PE2261				
22	3345	PE2262				Eligible
		PE2263				
		PE2264				
					PEPRO-23	
		PE422				
		PE423				
		PE576				
		PE577				
		PE369				
		PE576				
		PE2162				

Agency		Smithsonian No.	Component		NVN 075230 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	3345	PE2262				Eligible

NVN 075231 (PVA 9 Rye Patch)
This lease application consists of three sections (Township 31N/Range 33E Section 14 and Section 34). Fourteen cultural resources have been identified. Eleven are not NRHP eligible; three are unknown. Four cultural resources inventory (2-158, 2-381, 2-2445, and 2-2689) were conducted encompassing approximately 2,061 acres.

Agency		Smithsonian No.	Component		NVN 075231 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	2275	PE820				Not Eligible
22	3342	PE2260				
22	5458	PE2369				Not Eligible
22	6302					Not Eligible
22	6303					
22	6304					Not Eligible
22	6305					Not Eligible
22	6315					Not Eligible
22	6316					Not Eligible
22	6317					Not Eligible
22	6318					Not Eligible
22	6319					Not Eligible
22	6320					
22	6326					Not Eligible

NVN 075233 (PVA 8 San Emidio)
This lease application consists of five sections (Township 29N/Range 23E Section 4, Section 5, Section 6, Section 8, and Section 9). Eleven cultural resources have been identified. One is listed on the NRHP, one is NRHP eligible, two are considered potentially eligible, three are not eligible and three are unknown. At least one cultural resources inventory (6-759) was conducted encompassing approximately 1,244 acres.

Agency		**Smithsonian No.**	**Component**		**NVN 075233 Description**	**NRHP Status**
Prefix	***Number***		***Prehistoric***	***Historic***		
22	1212	WA3131				Potentially
22	386	WA2088				Undetermined
		WA3179				
		WA3180				
22	2558	WA3160				Not Eligible
22	2568	WA3170				Not Eligible
22	2580	WA3181				Potentially
22	2581	WA3182				Eligible
22	4181	WA3743				
22	5123	WA4711				Registered
22	5493	WA5345				Not Eligible

NVN 075234 (PVA 8 San Emidio)
This lease application consists of 3 sections (Township 29N/Range 23E Section 7, Section 18, and Section 19). Twenty-one cultural resources have been identified. Three are NRHP eligible and one is considered potentially eligible. One is undetermined. The others are not eligible. One cultural resources inventory (NSM 16-6) was conducted encompassing approximately 246 acres.

Agency		**Smithsonian No.**	**Component**		**NVN 075234 Description**	**NRHP Status**
Prefix	***Number***		***Prehistoric***	***Historic***		
22	1370	WA1656				Undetermined

Agency		Smithsonian No.	Component		NVN 075234 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	2558	WA3160				Not Eligible
22	2559	WA3161				Potentially
22	2560	WA3162				Not Eligible
22	2561	WA3163				Not Eligible
22	2562	WA3164				Not Eligible
22	2563	WA3165				Eligible
22	2564	WA3166				Not Eligible
22	2565	WA3167				Not Eligible
22	2566	WA3168				Not Eligible
22	2567	WA3169				Not Eligible
22	2568	WA3170				Not Eligible
22	2569	WA3171				Not Eligible
22	2570	WA3172				Not Eligible
22	2571	WA3173				Not Eligible
22	2572	WA3174				Not Eligible
22	2573	WA2924				Eligible
22	2574	WA3175				Not Eligible
22	2575	WA3176				Not Eligible
22	2576	WA3177				Eligible
22	2577	WA3178				Not Eligible

NVN 075419 (PVA 9 Rye Patch S)
This lease application consists of one section (Township 28N/Range 32E Section 22). One cultural resource site has been identified. It is NRHP eligible. One other cultural resource, a portion of the Emigrant Trail, is known to cross it. However, it has not been

identified in the field and has not been evaluated. Four cultural resources inventories (2-266, 2-2140, 2-2278, and 3-1215) were conducted encompassing approximately 61 acres.

Agency		Smithsonian No.	Component		NVN 075419 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	2460	PE2028	x	x	Projectile point, biface, scrapers, utilized flakes, mano, bone fragments, FCR, historic trash	Eligible

NVN 075552 (PVA 8 San Emidio)
This lease application consists of four sections (Township 30N/Range 23E Section 27, Section 29, Section 32, and Section 34). Four cultural resources have been identified. Two are NRHP eligible, one was collected in the field and the status of the other is unknown. Ten cultural resources inventories (2-66, 2-197, 2-583, 2-765, 2-1021, 2-2217, 2-2235, 2-2366, 2-2697, and 6-759) were conducted encompassing at least 54 acres.

Agency		Smithsonian No.	Component		NVN 075552 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
		WA3803				
22	1126	WA2650	x		Chert scraper.	No Longer
22	1211	WA3133	x		Quarry site, CCS material flaked; cores, bifaces. Eligible when combined with site 22-2716	Eligible
22	2716	WA3012	x		Chert quarry – large quantities of debitiage, bifaces, cores. Basalt hammerstones and tools are also present. Obsidian and basalt flakes and utilized petrified wood.	Eligible

NVN 075553 (PVA 8 San Emidio)
This lease application consists of three sections and a portion of another (Township 30N/Range 22E Section 25 W2, Section 26, Section 30 and Section 31). Nine cultural resources have been identified; their NRHP status is unknown. Three cultural resources

inventories (2-852, 2-1033, and 2-2403) were conducted encompassing at least 118 acres. One NRHP eligible property (22-623) is known to be located within one mile. It is an extensive lithic artifact scatter that includes manos, cores, tools and points. Material types include chert, jasper, chalcedony, basalt, and obsidian.

Agency		**Smithsonian No.**	**Component**		**NVN 075553 Description**	**NRHP Status**
Prefix	***Number***		***Prehistoric***	***Historic***		
22	3355		x		2 reddish rhyolite interior flakes.	
22	3356		x		One rhyolite flake.	
22	3357		x		One basalt flake	
22	3358		x		One obsidian flake.	
22	3359		x		One red rhyolite flake.	
22	3360		x		Two rhyolite scraping tools.	
22	3362		x		One CCS flake.	
22	3363		x		One basalt flake.	
22	3364		x		One CCS DSN point, two CCS flakes.	

NVN 075554 (PVA 8 San Emidio)

This lease application consists of three sections and a portion of another (Township 29N/Range 22E Section 1 and Section 2, and Township 30N/Range 23E Section 35 N2 and Section 36). Two cultural resources have been identified; their NRHP status is unknown. Three cultural resources inventories (2-319, 2-801, and 2-2714) were conducted encompassing at least 1.5 acres. Five NRHP eligible properties are located within one mile. Two are quarries. The other three are large lithic artifact scatters.

Agency		**Smithsonian No.**	**Component**		**NVN 075554 Description**	**NRHP Status**
Prefix	***Number***		***Prehistoric***	***Historic***		
22	2016		x		Chert flakes.	
22	6755		x		5 CCS flakes.	

NVN 075555 (PVA 8 San Emidio)
This lease application consists of four sections (Township 29N/Range 22E Section 23, Section 24, Section 25, and Section 26). No cultural resources have been identified. One cultural resources inventory (2-182) was conducted. It is not known how many acres the project encompassed.

NVN 075556 (PVA 8 San Emidio)
This lease application consists of four sections (Township 29N/Range 22E Section 11, Section 12, Section 13, and Section 14). Four cultural resources have been identified; their NRHP status is unknown. Four cultural resources inventories (2-2, 2-126, 2-182, and 2-2714) were conducted encompassing at least 246 acres. Three NRHP eligible properties are located within one mile. All are large lithic artifact scatters.

Agency		Smithsonian No.	Component		NVN 075556 Description	NRHP Status
Prefix	*Number*		*Prehistoric*	*Historic*		
22	6739		x		CCS flakes and one unifacial scraper of basalt.	
22	6740		x		Lithic scatter of CCS.	
22	6741		x		CCS shatter and flakes with basalt flakes.	
22	6742		x		Basalt flakes and one obsidian flake.	

NVN 075557 (PVA 8 San Emidio)
This lease application consists of two sections (Township 29N/Range 23E Section 30 and Section 31). No cultural resources have been identified. One cultural resources inventory (2-182) was conducted. It is not known how many acres the project encompassed. One interesting historic site is located within one mile. It is numbered 22-3258 and consists of the Three Mile Canyon well and windmill made by the C.C.C.

NVN 075558 (PVA 8 San Emidio)
This lease application consists of four sections (Township 29N/Range 22E Section 27, Section 34, Section 35, and Section 36). No cultural resources have been identified. One cultural resources inventory (2-182) was conducted. It is not known how many acres the project encompassed. The Pyramid Lake Indian Reservation encompasses all of Section 34 and half of Section 27.

KGRA CULTURAL RESOURCE INVENTORY REPORTS

KGRA	CLASS II SURVEYS		CLASS III SURVEYS		AREA SURVEYED	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
Brady			2-83	18-9	225.407	
			2-116	1-38	313.106	
			2-240	1-216	18.827	
				1-265	186.037	
				1-267	21.46	
				1-288	2.5	
			2-348	18-72	228.167	
			2-499	18-89	234.203	
			2-753	1-198	142.509	
			2-921	1-232	494.135	
			2-964		2.5	
				18-16	173.878	
				18-127	37.67	
				18-242	157.817	
			2-2239		358.171	
Subtotal Class III					**2596.45**	**5.3%**
Dixie Valley	2-141	14-40			1987.5	
Subtotal Class II					**1987.5**	**1.0%**
Dixie Valley			2-129	14-57	9.9	
			2-316	14-72	7.5	
			2-964		2.5	
			2-2285	14-202	83.6	
			3-16	1-23	2.5	
			3-179	1-61	4.9	
			3-300	1-56	75.3	
			3-355	1-239	2.5	
			3-800	1-103	2.5	
			3-805	1-104	31.2	
			3-1200	18-262	259.1	

KGRA	CLASS II SURVEYS		CLASS III SURVEYS		AREA SURVEYED	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
Subtotal Class III					**481.5**	**0.2%**
Gerlach				16-24	14.9	
				16-25	37.301	
				16-84	477.384	
				16-100	21.604	
				16-116	121.8	
				16-127	23.201	
				16-350	12.58	
				16-351	2.132	
				16-357	13.3	
				16-358	2.832	
				16-513	2.487	
				16-529	29.708	
				16-623	5.252	
				16-626	12.4	
				16-633	15.403	
				16-692	0.754	
				16-692-1	0.754	
				16-693	0.754	
				16-897	1051.881	
				18-230	129.301	
				18-230	57.96	
				18-277	132.811	
				18-334	24.358	
Subtotal Class III					**2190.8**	**22.7%**
New York Canyon				14-67	23.1	
				14-158	2.7	
				18-262	248.5	
			2-342		2.5	
			2-346		7.5	
			2-955		2.5	

KGRA	CLASS II SURVEYS		CLASS III SURVEYS		AREA SURVEYED	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
Subtotal Class III					**286.8**	**3.8%**
Rye Patch				14-63	2.0	
				14-75	45.1	
				18-253	118.0	
			2-782		2.5	
			2-991		7.5	
			2-1205		45.4	
			2-2140		386.5	
			2-2388		33.4	
			2-2434		10.0	
			2-2442		1358.6	
			2-2524		478.3	
			2-2665		41.5	
			2-2689		3345.1	
			2-2742		661.6	
Subtotal Class III					**6535.5**	**33.6%**
San Emidio				6-144	7.5	
				16-6	246.2	
				16-71	35.4	
				16-72	51.8	
				16-74	6.0	
				16-111	642.8	
				16-318	55.1	
				16-362	5.0	
				16-373	74.7	
				16-383	2.0	
				16-461	5.2	
				16-566	76.2	
				16-568	39.1	
Subtotal Class III					**1247.0**	**16.2%**

CULTURAL RESOURCE SITES BY KGRA

BRADY					
Agency No.		**Smithsonian No.**	**Component**		**NRHP Status**
Prefix	***Number***		***Historic***	***Prehistoric***	
22	135	CH315	x	x	Undetermined
22	136	CH316	x	x	Undetermined
22	137	CH202	x	x	Eligible
22	138	CH317	x	x	Undetermined
22	139	CH318	x	x	Undetermined
22	151	CH319	x	x	Not eligible
22	157	CH325	x	x	Not eligible
22	159	CH327	x	x	Not eligible
22	160	CH328	x	x	Not eligible
22	161	CH329	x	x	Not eligible
22	199	CH341	x	x	Not eligible
22	231	CH331	x	x	Eligible
22	240	CH337	x	x	Eligible
	0	CH341		x	
22	736	CH574	x	x	Not eligible
22	1897	CH901	x	x	Not eligible
	0	CH971		x	
	0	CH972		x	
	0	CH973		x	
	0	CH974		x	
	0	CH975		x	
	0	CH976		x	
	0	CH977		x	
	0	CH978		x	
	0	CH979		x	
	0	CH980		x	
	0	CH981		x	
	0	CH987		x	
22	3754	CH1074	x	x	Not eligible
22	3755	CH1075	x	x	Undetermined

BRADY					
Agency No.		Smithsonian No.	Component		NRHP Status
Prefix	*Number*		*Historic*	*Prehistoric*	
22	5574	22-5574	x	x	Not eligible

DIXIE VALLEY					
Agency No.		Smithsonian No.	Component		NRHP Status
Prefix	*Number*		*Historic*	*Prehistoric*	
		CH500		x	
3	1236	CH1010	x	x	
22	737	PE671	x	x	Undetermined
22	738	PE672	x	x	Undetermined
22	739	PE673	x	x	Not eligible
22	740	PE674	x	x	Not eligible
22	741	PE675	x	x	Undetermined
22	742	PE676	x	x	Not eligible
22	743	PE53	x	x	
22	743	PE677	x	x	Eligible
22	744	PE678	x		Potentiall
22	744	PE678	x	x	Potentiall
22	2540	PE738	x	x	Undetermined
		PE739		x	
		PE748	x	x	
		PE747	x	x	
		PE1012		x	
22	2774	PE2075	x	x	Undetermined
22	2775	PE2076	x	x	Undetermined
22	2776	PE2077	x	x	Undetermined
22	2778	PE2079	x	x	Undetermined
22	2780	PE2081	x	x	Undetermined

GERLACH					
Agency No.		Smithsonian No.	Component		NRHP Status
Prefix	*Number*		*Historic*	*Prehistoric*	
22	31	WA2250	x	x	Undetermined
22	32	WA2249	x	x	Not eligible
22	33	WA1421	x	x	Undetermined
22	37	WA2254	x	x	Not eligible
22	38	WA2255	x	x	Not eligible
22	39	WA2256	x	x	Not eligible
22	40	WA2257	x	x	Not eligible
22	41	WA2258	x	x	Not eligible
22	42	WA2259	x	x	Not eligible
22	43	WA2271	x	x	Not eligible
22	44	WA2272	x		Not eligible
22	45	WA2273	x		Not eligible
22	46	WA2274	x		Not eligible
22	48	WA2276	x		Not eligible
22	49	WA2277	x	x	Not eligible
22	78	WA2297	x	x	Not eligible
22	79	WA2298	x		Not eligible
	0	WA2272		x	
	0	WA2273		x	
	0	WA2274		x	
	0	WA2276		x	
22	87	WA2278	x	x	Undetermined
	0	WA2298		x	
22	383	WA2502	x	x	Undetermined
	0	WA2592		x	
22	902	WA2649	x	x	Not eligible
	0	WA2668		x	
	0	WA2669		x	
	0	WA2670		x	
22	2532	WA2758	x	x	Undetermined
22	2617	WA2668	x		Eligible

GERLACH					
Agency No.		Smithsonian No.	Component		NRHP Status
Prefix	*Number*		*Historic*	*Prehistoric*	
22	2644	WA2908	x	x	Undetermined
22	2858	WA3011	x	x	Undetermined
	0	WA5549		x	
22	6814	WA6409	x	x	Eligible
	0	WA6624		x	
	0	WA6626		x	
	0	WA6627		x	
	0	WA6628		x	
	0	WA6629		x	
	0	WA6630		x	
	0	WA6632		x	
	0	WA6633		x	
	0	WA6634		x	
	0	WA6635		x	

RYE PATCH					
Agency No.		Smithsonian No.	Component		NRHP Status
Prefix	*Number*		*Historic*	*Prehistoric*	
		PE58		x	
		PE75		x	Undetermined
21	6136	21-6136	x	x	Eligible
21	6137	21-6137	x	x	Eligible
21	6138	21-6138	x	x	Not eligible
21	6139	21-6139	x	x	Not eligible
		PE369	x	x	
		PE428	x	x	Eligible
22	232	PE469	x	x	Undetermined
22	388	PE575	x	x	Not eligible
22	389	PE576	x	x	Other
22	390	PE577	x	x	Undetermined
22	391	PE578	x	x	Other

RYE PATCH					
Agency No.		Smithsonian No.	Component		NRHP Status
Prefix	*Number*		*Historic*	*Prehistoric*	
22	394	PE579	x	x	Eligible
22	408	PE580	x	x	Other
22	459	PE2162	x	x	Undetermined
22	837	PE583	x	x	Not eligible
22	838	PE584	x	x	Other
22	1006	PE649	x	x	No Longer
22	1210	PE128	x	x	
22	1327	PE75	x		Undetermined
22	1348	PE58	x		
22	1829	PE420	x	x	
22	1830	PE421	x	x	
22	1831	PE422	x	x	
22	1832	PE423	x	x	
22	1833	PE424	x	x	
22	1834	PE425	x	x	
22	1835	PE426	x	x	
22	1836	PE453	x	x	No Longer
22	1837	PE429	x	x	
22	2275	PE820	x	x	Not eligible
22	2645	PE2096	x	x	
22	3069	PE2037	x	x	Eligible
22	3341	PE2259	x	x	
22	3342	PE2260	x	x	
		PE2261	x	x	
22	3345	PE2262	x	x	Eligible
		PE2263		x	
		PE2264	x	x	
		PE2265	x	x	
22	3348	PE2267	x	x	Eligible
22	3349	PE2266	x	x	
22	3350	PE2268	x	x	
22	3351	PE2269	x	x	

RYE PATCH					
Agency No.		**Smithsonian No.**	**Component**		**NRHP Status**
Prefix	***Number***		***Historic***	***Prehistoric***	
22	3352	PE2271	x	x	
22	3353	PE2270	x	x	Eligible
22	3354	PE2272	x	x	
22	5299	PE2244	x	x	
22	5415	22-5415	x	x	
		PE2344	x	x	
22	5447	PE2358	x	x	Not eligible
22	5448	PE2359	x	x	Not eligible
22	5449	PE2360	x	x	Not eligible
22	5450	PE2361	x	x	Not eligible
22	5451	PE2362	x	x	Not eligible
22	5452	PE2363	x	x	Not eligible
22	5453	PE2364	x	x	Not eligible
22	5454	PE2365	x	x	Not eligible
22	5455	PE2366	x	x	Not eligible
22	5456	PE2367	x	x	Not eligible
22	5457	PE2368	x	x	Not eligible
22	5458	PE2369	x	x	Not eligible
22	5459	PE2370	x	x	Not eligible
		PE2377	x	x	Not eligible
22	5618	22-5618	x	x	Not eligible
22	5621	22-5621	x	x	Not eligible
22	5622	22-5622	x	x	Not eligible
22	6299	22-6299	x	x	Not eligible
22	6300	22-6300	x	x	Not eligible
22	6301	22-6301	x	x	Not eligible
22	6302	22-6302	x	x	Not eligible
22	6303	22-6303	x	x	Not eligible
22	6304	22-6304	x	x	Not eligible
22	6305	22-6305	x	x	Not eligible
22	6312	22-6312	x	x	Eligible
22	6313	22-6313	x	x	Not eligible

RYE PATCH					
Agency No.		Smithsonian No.	Component		NRHP Status
Prefix	*Number*		*Historic*	*Prehistoric*	
22	6314	22-6314	x	x	Not eligible
22	6315	22-6315	x	x	Not eligible
22	6316	22-6316	x	x	Not eligible
22	6317	22-6317	x	x	Not eligible
22	6318	22-6318	x	x	Not eligible
22	6319	22-6319	x	x	Not eligible
22	6320	22-6320	x	x	Not eligible
22	6321	22-6321	x	x	Not eligible
22	6326	22-6326	x	x	Not eligible
22	6327	22-6327	x	x	Eligible
22	6328	22-6328	x	x	Not eligible
22	6329	22-6329	x	x	Not eligible
22	6330	22-6330	x	x	Not eligible
22	6331	22-6331	x	x	Not eligible
22	6332	22-6332	x	x	Not eligible
22	6337	22-6337	x	x	Eligible
22	6338	22-6338	x	x	Not eligible
22	6339	22-6339	x	x	Eligible
22	6340	22-6340	x	x	Eligible
22	6341	22-6341	x	x	Eligible
22	6342	22-6342	x	x	
22	6344	22-6344	x	x	Not eligible
22	6345	22-6345	x	x	Eligible
22	6346	22-6346	x	x	Not eligible
22	6347	22-6347	x	x	
22	6399	22-6399	x	x	Eligible
22	6414	22-6414	x	x	Not eligible
22	6415	22-6415	x	x	Not eligible
22	6416	22-6416	x	x	Not eligible
22	6417	22-6417	x	x	Not eligible
22	6418	22-6418	x	x	Not eligible
22	6419	22-6419	x	x	Not eligible

RYE PATCH					
Agency No.		**Smithsonian No.**	**Component**		**NRHP Status**
Prefix	***Number***		***Historic***	***Prehistoric***	
22	6420	22-6420	x	x	Not eligible

SAN EMIDIO					
Agency No.		**Smithsonian No.**	**Component**		**NRHP Status**
Prefix	***Number***		***Historic***	***Prehistoric***	
22	386	WA2088	x	x	Undetermined
22	387	WA2089	x	x	Undetermined
22	1212	WA3131	x	x	Potentiall
22	1370	WA1656	x	x	Undetermined
22	2558	WA3160	x	x	Not eligible
22	2559	WA3161	x	x	Potentiall
22	2560	WA3162	x	x	Not eligible
22	2561	WA3163	x	x	Not eligible
22	2562	WA3164	x	x	Not eligible
22	2563	WA3165	x	x	Eligible
22	2564	WA3166	x	x	Not eligible
22	2565	WA3167	x	x	Not eligible
22	2566	WA3168	x	x	Not eligible
22	2567	WA3169	x	x	Not eligible
22	2568	WA3170	x	x	Not eligible
22	2569	WA3171	x	x	Not eligible
22	2570	WA3172	x	x	Not eligible
22	2571	WA3173	x	x	Not eligible
22	2572	WA3174	x	x	Not eligible
22	2573	WA2924	x	x	Eligible
22	2574	WA3175	x	x	Not eligible
22	2575	WA3176	x	x	Not eligible
22	2576	WA3177	x	x	Eligible
22	2577	WA3178	x	x	Not eligible
22	2578	WA3179	x	x	Not eligible

SAN EMIDIO					
Agency No.		**Smithsonian No.**	**Component**		**NRHP Status**
Prefix	***Number***		***Historic***	***Prehistoric***	
22	2579	WA3180	x	x	Not eligible
22	2580	WA3181	x	x	Potentiall
22	2581	WA3182	x	x	Eligible
22	4181	WA3743	x	x	Eligible
22	5123	WA4711	x	x	Registered
22	5493	WA5345	x	x	Not eligible
22	5494	WA5346	x	x	Not eligible
22	5495	WA5347	x	x	Not eligible

SURVEYS WITHIN PVAS

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
1	2-161	7-48			15.0	
1	2-486	7-91			303.3	
1	2-994	7-392			2551.8	
Subtotal Class II					**2,870.1**	**1.5%**
1			2-79	7-25	56.6	
1			2-187	7-62	9.9	
1			2-191	7-64	29.8	
1			2-132	7-66	14.9	
1			2-142	7-82	40.0	
1			2-313	7-83	15.1	
1			2-115-1	7-86	88.2	
1			2-419	7-90	35.2	
1			2-264	7-95	12.4	
1			2-190	7-116	5.0	
1			2-371	7-152	38.6	
1			2-598	7-153	2.5	
1			2-715	7-155	3.0	
1			2-797	7-156	24.6	
1			2-280	7-192	6.4	
1			2-465	7-193	2.6	
1			2-466	7-194	4.1	
1			2-591	7-195	5.0	
1			2-833	7-196	2.4	
1			2-519	7-311	707.1	
1			2-560	7-370	65.0	
1			2-846	7-383	143.1	
1			2-983	7-391	85.0	
1			2-838	7-400	34.2	
1			2-1039	7-444	59.9	
1			2-1065	7-447	31.8	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
1			2-1081	7-449	21.9	
1			2-2017	7-451	148.9	
1			2-2040	7-456	73.9	
1			2-2114	7-475	5.0	
1			2-906	7-516	8.5	
1			2-911	7-517	30.5	
1			2-912	7-518	2.5	
1			2-932	7-525	16.3	
1			2-1030	7-545	5.2	
1			2-1043	7-550	45.3	
1				7-580	42.8	
1				18-136	86,951.5	
Subtotal Class III					**88,874.7**	**48.9%**
2	2-74	7-23			7029.9	
2	2-162	7-47			2.5	
2	2-486	7-91			422.6	
2	2-920	7-387			4112.7	
Subtotal Class II					**11,567.7**	**7.8%**
2			2-9	7-3	19.6	
2			2-20	7-8	26.070	
2			2-33	7-15	22.980	
2			2-74	7-406	7029. 9	
2			2-105	7-31	12.675	
2			2-132	7-66	5.0	
2			2-142	7-82	5.0	
2			2-199	7-38	49.9	
2			2-370	7-157	14.3	
2			2-372	7-254	34.0	
2			2-373	7-255	41.6	
2			2-448	7-158	1090.2	
2			2-492	7-258	3.0	
2			2-590	7-377	26.7	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
2			2-611	7-262	42.0	
2			2-660	7-376	8.3	
2			2-691	7-154	2.5	
2			2-712	7-263	21.2	
2			2-740	7-134	74.1	
2			2-742	7-372	12.8	
2			2-895	7-512	25.9	
2			2-1082	7-561	10.0	
2			2-1094	7-567	2.6	
2			2-2017	7-451	79.5	
2			2-2129	7-480	804.4	
2				18-136	20592.0	
Subtotal Class III					**23026.3**	**15.6%**
3			2-261	7-357	15.0	
3			2-367	7-499	43.5	
Subtotal Class III					**58.5**	**0.3%**
4	2-247	7-119			4002.1	
Subtotal Class II					**4002.1**	**18.9%**
4			unknown	unknown	39.3	
4			2-533	7-216	31.8	
4			2-650	7-220	26.8	
4			2-685	7-221	5.0	
4			2-739	7-223	10.10	
4			2-810	7-224	0.4	
4			2-824	7-338	3.6	
Subtotal Class III					**117.0**	**0.5%**
5	2-561	7-148			57.6	
Subtotal Class II					**57.6**	**<0.1%**
5			2-54	7-17	26.3	
5			2-130	7-58	10.5	
5			2-166	7-46	8.0	
5			2-230	7-145	12.7	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	***NSM No.***	***Agency No.***	***NSM No.***	***Acres***	***Percent***
5			2-234	7-10	9.3	
5			2-436	7-147	5.0	
5			2-445	7-107	1186.2	
5			2-447	7-277	10.7	
5			2-513	7-278	22.7	
5			2-528	7-279	4.4	
5			2-626	7-283	10.8	
5			2-646	7-284	18.8	
5			2-812	7-309	56.3	
5			2-827	7-285	3.0	
5			2-828	7-286	11.2	
5			2-854	7-373	7.0	
5			2-900	7-403	125.5	
5			2-2046	7-458	123.9	
5			2-2065	7-462	16.9	
5			2-2119	7-477	88.5	
5			2-2120	7-478	20.4	
5			2-2142	7-412	1274.7	
Subtotal Class III					**3052.8**	**4.1%**
6			2-181	7-37	34.0	
6			2-183	7-54	30.8	
6			2-188	7-63	66.6	
6			2-196	7-55	4.4	
6			2-478	7-112	2.1	
6			2-704	7-233	1.8	
6			2-860	7-321	2.5	
6			2-881	7-504	6.9	
6			2-987	7-394-1	80.2	
6			2-1036	7-548	116.1	
6			2-2018	7-452	76.7	
6			2-2060	7-461	21.9	
Subtotal Class III					**444.0**	**0.4%**

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
7	2-173	14-48			2.3	
7	2-175	7-61			3.7	
7	2-1045	7-395			321.1	
7	2-1046	7-446			43.5	
7	2-2041	7-457			100.1	
7	2-2054	7-459			336.9	
7	2-2761				453.0	
Subtotal Class II					**1260.6**	**0.1%**
7				7-9	4189.9	
7			1-58	7-29	7.5	
7			1-60	7-28	7.5	
7			2-39	7-18	26.5	
7			2-83	18-9	183.5	
7			2-100	7-30	11.7	
7			2-110	7-22	175.5	
7			2-127	7-40	337.9	
7				7-92	173.6	
7				7-105	13.5	
7			2-193	7-45	69.6	
7			2-195	7-70	7.2	
7			2-198	7-56	11.0	
7			2-217	7-74	6.2	
7			2-227	7-238	5.0	
7			2-268	7-100	5.0	
7			2-274	7-240	14.2	
7			2-277	7-241	20.2	
7			2-232	7-81	45.9	
7			2-301	7-111	249.4	
7			2-314	7-14	42.9	
7			2-315	7-85	18.0	
7			2-348	18-72	79.6	
7			2-353	7-242	7.0	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
7			2-400	7-243	7.5	
7			2-401	7-245	31.9	
7			2-402	7-110	44.8	
7			2-415	7-265	235.3	
7			2-421	7-185	38.0	
7			2-424	7-355	1.7	
7			2-428	7-266	17.4	
7			2-429	7-267	9.2	
7			2-430	7-264	40.9	
7			2-438	7-246	10.4	
7			2-459	7-323	22.4	
7			2-483	7-268	20.2	
7			2-500	7-269	1.9	
7			2-501	7-270	2.7	
7			2-516	7-271	1.8	
7			2-549	7-272	9.6	
7			2-552	7-187	22.2	
7			2-563	7-79	10.3	
7			2-578	7-342	0.8	
7			2-601	7-248	30.0	
7			2-659	7-364	2.2	
7			2-681	7-273	9.1	
7			2-683	7-121	73.9	
7			2-684	7-310	17.4	
7			2-689	18-169	4.8	
7			2-697	7-133	2.4	
7			2-698	7-247	5.3	
7			2-700	7-189	5.6	
7			2-705	7-237	18.3	
7			2-706	7-356	1.7	
7			2-708	7-274	4.7	
7			2-713	7-366	1.1	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
7			2-760	18-166	73.6	
7			2-770	7-275	16.4	
7			2-788	7-249	107.4	
7			2-789	7-322	12.9	
7			2-800	7-353	9.1	
7			2-811	7-137	94.6	
7			2-837	7-276	5.4	
7			2-839	7-250	4.7	
7			2-840	7-302	239.8	
7			2-877	7-385	10592.2	
7			2-879	7-503	870.3	
7			2-900	7-403	32.4	
7			2-915	7-519	3.9	
7			2-924	7-138	131.7	
7			2-930	7-523	2.5	
7			2-940	7-435	2.5	
7			2-941	7-527	5.0	
7			2-946	7-532	3.8	
7			2-948	7-534	2.5	
7			2-949	7-535	2.5	
7			2-950	7-536	14.9	
7			2-978	7-439	43.3	
7			2-1013	7-442	295.6	
7			2-1014	7-541	200.7	
7			2-1015	7-404	12.3	
7			2-1019	7-542	99.9	
7			2-1026	7-543	12.5	
7			2-1032	7-546	10.8	
7			2-1049	7-552	39.5	
7			2-1080	7-445	20.5	
7			2-1090	7-416	12801.0	
7			2-1091	7-564	2.5	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
7			2-1092	7-565	2.5	
7			2-1093	7-566	30.9	
7			2-1316	7-584	628.2	
7			2-2011	7-450	12.2	
7			2-2089	7-466	327.2	
7			2-2090	7-467	162.9	
7			2-2108	7-468	33.0	
7			2-2140	2-2140	31.3	
7			2-2157	7-538	3.9	
7			2-2207	7-482	487.5	
7			2-2236	7-577	2117.7	
7			2-2294	7-576	261.9	
7			2-2346	7-575	81.5	
7			2-2376	7-495	1079.7	
7			2-2384	7-493	727.4	
7			2-2396	7-496	230.2	
7			2-2485	7-494	3417.8	
7			2-2678	7-571	5155.0	
7			2-2952	7-103	46.7	
7			3-1215	18-253	206.5	
Subtotal Class III					**46971.5**	**6.9%**
8	2-59	1-15			4669.7	
8	2-164	1-53			1287.7	
8	2-443	14-78			3821.8	
8	2-2163	14-142			444.1	
8	2-2761				323.9	
8	2-2778				16850.5	
Subtotal Class II					**27397.7**	**2.0%**
8			unknown	unknown	21355.9	
8			1-288		2.5	
8			2-83	18-9	313.2	
8			2-112	1-54	36.5	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
8			2-116	1-38	313.1	
8			2-122	1-47	3.4	
8			2-154	1-44	2.5	
8			2-155	14-29	17.4	
8			2-186	14-52	14.9	
8			2-240	1-216	18.8	
8			2-348	18-72	317.9	
8			2-408	14-76	26.0	
8			2-451	14-123	2.6	
8			2-457	1-155	38.0	
8			2-499	18-89	440.0	
8			2-676		2.5	
8			2-678		15.0	
8			2-725	18-162	403.5	
8			2-753	1-198	206.0	
8			2-795	14-92	14.8	
8			2-801	18-170	21.2	
8			2-802	18-244	19.9	
8			2-806	14-95	550.4	
8			2-822	7-234	9.3	
8			2-850		3.7	
8			2-853		5.0	
8			2-898		12.1	
8			2-921	1-232	494.0	
8			2-954		2.5	
8			2-955		7.5	
8			2-957		46.8	
8			2-960		2.5	
8			2-964		24.8	
8			2-982		5.0	
8			2-988		8.2	
8			2-996		7.5	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
8			2-1018		2.5	
8			2-1029		5.0	
8			2-2049		2.5	
8			2-2070		2.5	
8			2-2088		2.5	
8			2-2139	16-318	62.6	
8			2-2218	14-192	3.3	
8			2-2238	14-194	2.5	
8				18-16	243.2	
8				18-149	57.4	
8				18-277	253.0	
8			2-2263	18-270	47.9	
8			2-2263	18-270-1	1.3	
8			2-2263	18-270-2	67.5	
8			2-2327	14-211	42.7	
8			2-2389		5.0	
8			2-2498		36.6	
8			2-2547		32.8	
8			2-2570		5.7	
8			2-2596		17.4	
8			2-2718		2.5	
8			2-2721		1599.0	
8			2-2746		70.0	
8			2-2758		7.5	
8			2-2765	18-372	261.2	
8			2-2776		4.7	
8			3-102	18-18	22.3	
Subtotal Class III					**27626**	**2.1%**
9	2-61	14-17			1602.0	
9	2-103	14-32			1748.5	
9	2-158	14-43			2042.1	
9	2-177	14-50			0.8	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	***NSM No.***	***Agency No.***	***NSM No.***	***Acres***	***Percent***
9	2-381	14-75			45.2	
9	2-434	14-106			2360.0	
9	2-1035	14-141			2551.3	
9	2-2056				557.1	
Subtotal Class II					**10907.0**	**5.4%**
9			unknown	unknown	8.6	
9				PE058-89P	352.0	
9				PE93-011R	2.0	
9				14-7	87.2	
9				14-9	72.4	
9			/A	14-140	32.9	
9				14-174	562.1	
9			2-44	14-24	30.2	
9			2-51	14-15	102.8	
9			2-66	14-16	1.3	
9			2-83	18-9	156.9	
9			2-109	14-68	101.7	
9			2-213	14-63	2.5	
9			2-224	14-176	36.6	
9			2-266	14-156	42.8	
9			2-272	14-157	84.1	
9			2-276	14-180	206.8	
9			2-302	14-152	422.6	
9			2-309	14-153	2.5	
9			2-332		15.0	
9			2-348	18-72	156.7	
9			2-460		158.9	
9			2-499	18-89	123.4	
9			2-507	14-79	6.7	
9			2-508	14-105	6.2	
9			2-517	14-117	157.0	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
9			2-520		2.5	
9			2-653		39.5	
9			2-654		2.5	
9			2-689	18-169	7.5	
9			2-702	14-160	41.4	
9			2-716	14-161	5.5	
9			2-752	14-90	41.8	
9			2-754	14-96	66.4	
9			2-761	14-73	69.3	
9			2-775		44.7	
9			2-782		2.5	
9			2-783		5.0	
9			2-790	14-101	3.6	
9			2-807	14-118	55.3	
9			2-845		17.5	
9			2-865	14-108	2.8	
9			2-933		2.4	
9			2-991		5.0	
9			2-1004		2.5	
9			2-1020		7.5	
9			2-1051		2.5	
9			2-1205		46.9	
9			2-2022	14-132	38.7	
9			2-2140		366.5	
9			2-2173		85.6	
9			2-2193		74.3	
9			2-2206	14-185	1.2	
9			2-2278		130.0	
9			2-2284	14-201	562.2	
9			2-2295	14-206	52.6	
9			2-2308	14-207	837.1	
9			2-2320	14-210	6.1	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
9			2-2327	14-211	46.2	
9			2-2362	14-217	50.1	
9			2-2388		166.3	
9			2-2394		16.9	
9			2-2400		28.4	
9			2-2432		124.5	
9			2-2434		10.0	
9			2-2442		1358.6	
9			2-2445	14-168	2519.6	
9			2-2462		2.5	
9			2-2473		27.9	
9			2-2484		1.4	
9			2-2501		4.1	
9			2-2502		47.7	
9			2-2514		20.1	
9			2-2524		478.3	
9			2-2537		2.5	
9			2-2548		2.5	
9			2-2610		152.0	
9			2-2661		33.6	
9			2-2665		41.5	
9			2-2670	14-173	128.6	
9			2-2689		3345.3	
9			2-2735		9.9	
9			2-2740		30.1	
9			2-2742		661.6	
9			2-2760		42.8	
9			2-2789		209.5	
9			3-1215	18-253	451.9	
9				18-16	5.4	
9				18-149	87.2	
Subtotal Class III					**15667.8**	**7.8%**

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
10	2-177	14-50			1.2	
10	2-808	14-113			83.3	
Subtotal Class II					**84.5**	**0.1%**
10			2-83	18-9	67.1	
10			2-95	14-25	46.7	
10			2-107	14-53	15.3	
10			2-128	14-70	44.2	
10			2-139	14-34	12.3	
10			2-145	14-41	1.5	
10			2-204	14-154	8.8	
10			2-342		37.3	
10			2-348	18-72	67.9	
10			2-511		3.9	
10			2-757	2-757	35.7	
10			2-809		17.4	
10			2-2107		0.7	
10			2-2614		36.6	
10			2-2628		8.9	
10			2-2734		118.7	
Subtotal Class III					**523.0**	**0.8%**
11			unknown	unknown	445.8	
11				14-1	17.4	
11				14-2	7.5	
11			2-25	14-5	150.8	
11			2-31	14-3	198.8	
11			2-55	14-13	7.5	
11			2-72	14-14	29.8	
11			2-77	14-11	40.5	
11			2-81	14-22	5.7	
11			2-83	18-9	208.2	
11			2-87	14-10	19.9	
11			2-94	14-12	17.4	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
11			2-134	14-36	0.6	
11			2-143	14-58	10.0	
11			2-252	14-155	20.5	
11			2-338	2-338	137.9	
11				18-16	0.6	
11			2-348	18-72	217.3	
11			2-388	2-388	11.9	
11			2-408	14-76	5.6	
11			2-499	18-89	60.2	
11			2-539	2-539	2.5	
11			2-795	14-92	59.9	
11			2-796	14-162	112.3	
11			2-975	2-975	2.8	
11			2-992	2-992	24.8	
11			2-2194	14-182	11.6	
11			2-2239		337.8	
11			2-2263	18-270-1	19.6	
11			2-2289	14-204	13.5	
11			2-2691		906.2	
11			2-2704		3141.1	
11				18-277	157.1	
Subtotal Class III					**6403.2**	**6.8%**
12			2-208	14-8	63.1	
12			2-330	14-158	7.5	
12			2-342		2.5	
12			2-346		7.5	
12			2-442	14-67	33.0	
12			2-757		3.2	
12			2-798	14-99	645.9	
12			2-955		2.5	
12			2-990		7.5	
12			2-2503		87.5	

PVA No.	Class II surveys		Class III surveys		Area Surveyed	
	Agency No.	*NSM No.*	*Agency No.*	*NSM No.*	*Acres*	*Percent*
12			3-1200	18-262	134.4	
12					994.6	
12			2-208	14-8	63.1	
12			2-330	14-158	7.5	
12			2-342		2.5	
12			2-346		7.5	
12			2-442	14-67	33.0	
12			2-757		3.2	
12			2-798	14-99	645.9	
12			2-955		2.5	
12			2-990		7.5	
12			2-2503		87.5	
12			3-1200	18-262	134.4	
Subtotal Class III					**994.6**	**1.9%**
13	2-141	14-40			1987.5	
Subtotal Class II					**1987.5**	**0.7%**
13			unknown	unknown	1430.2	
13			2-27	14-23	115.7	
13			2-83	18-9	28.8	
13			2-129	14-57	13.0	
13			2-151 (N))	14-33	3.8	
13			2-214	14-175	12.8	
13			2-316	14-72	19.3	
13			2-325	14-109	78.4	
13			2-344	14-159	18.8	
13			2-964		2.5	
13			2-2680		2352.4	
13			3-300	1-56	75.3	
13			3-1200	18-262	258.1	
13			6-206	14-86	100.4	
13			6-330	14-84	216.7	
Subtotal Class III					**4726.2**	**1.7%**

PVA SITES AND NRHP STATUS

PVA 1				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	HU1088	x		
	HU1242	x		
	HU2219	x		
5	HU578	x	x	Undetermined
5	HU1030	x	x	Undetermined
409	HU1024	x	x	Not eligible
409	HU866	x	x	Not eligible
410	HU867	x	x	Not eligible
411	HU868	x		Not eligible
412	HU869	x	x	Not eligible
413	HU870	x	x	Not eligible
414	HU871	x	x	Not eligible
415	HU872	x	x	Not eligible
613	HU106	x		Not eligible
745	HU1023	x	x	Undetermined
746	HU1025	x	x	Undetermined
747	HU1026	x	x	Undetermined
748	HU1027	x	x	Undetermined
749	HU1028	x	x	Undetermined
750	HU1029	x		Undetermined
751	HU1031	x		Undetermined
1015	HU1135	x	x	Not eligible
1016	HU2219		x	Not eligible
1118	HU1240	x	x	No Longer
1119	HU1241	x		Undetermined
1788	HU2240	x	x	No Longer
2222	HU2234	x	x	No Longer
2224	HU2235	x		Not eligible
2389	HU2205	x		Undetermined
2390	HU2206	x		Undetermined

PVA 1				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
2391	HU2207	x	x	Undetermined
2392	HU2208	x		Undetermined
2393	HU2209	x		
2394	HU2210	x		Undetermined
2395	HU2211	x		Undetermined
2396	HU2212	x		Undetermined
2397	HU2213	x		Undetermined
2398	HU2214	x		Undetermined
2606	HU2228	x		
2607	HU2229	x		
2632	HU1379	x		Not eligible
2633	HU1380	x	x	Not eligible
2634	HU1381	x		Not eligible
2635	HU1382	x		Not eligible
2636	HU1383	x		Not eligible
2637	HU1384	x	x	Not eligible
2638	HU1385	x		Not eligible
2639	HU1386	x		Not eligible
2657	HU1378	x		Not eligible
2663	HU1562	x	x	Undetermined
2686	HU1563	x		
2721	HU1309	x		Not eligible
3016	HU1310	x	x	Not eligible
3017	HU1834	x		
3018	HU1833	x		
3028	HU1731	x		
3029	HU1732	x		
3030	HU1733	x		
3031	HU1734	x		
3032	HU1735	x		
3033	HU1736	x		
3034	HU1737	x		
3036	HU1738	x		

PVA 1				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
3037	HU1739	x		
3038	HU1740	x		
3039	HU1741	x		
3255	HU1785	x	x	Not eligible
3256	HU1786	x		Not eligible
3257	HU2759	x	x	Not eligible
3401	HU2807	x		
3402	HU2808	x		
3419	HU2813	x		
3556	HU2815	x		

PVA 2				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
281	HU310	x	x	Undetermined
292	HU2010	x		Undetermined
587	HU892	x	x	Not eligible
588	HU893	x		Not eligible
589	HU894	x		Not eligible
590	HU895	x		Not eligible
591	HU896	x		Not eligible
593	HU898	x		Not eligible
2597	HU2218	x		
2603	HU2225	x		
2604	HU2226	x		
2605	HU2227	x		
2791	HU2430	x		Not eligible
2792	HU2431	x	x	Not eligible
2793	HU2432	x	x	Not eligible
2845	HU1349	x		
3151	HU2707	x		Not eligible
3152	HU1765	x	x	
3153	HU1766	x		

PVA 2				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
3154	HU1767	x		
3155	HU1768	x	x	
3156	HU2708	x	x	
3157	HU2709	x		
3158	HU2710	x		
3159	HU2711	x		
3160	HU2712	x		
3161	HU2713	x		
3162	HU1769	x		
3164	HU1771	x	x	
3165	HU1772	x		
3166	HU1773	x	x	
3167	HU1774	x	x	
3558	HU2817	x		
3559	HU2818	x		
3789	HU2881	x	x	
3790	HU2882	x		

PVA 3				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1684	HU154	x		Not eligible
1692	HU162	x	x	Not eligible

PVA 4				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1371	HU1578	x	x	Potentially
1372	HU1579	x		Not eligible
1373	HU1580	x		Not eligible
1374	HU1581	x	x	Not eligible
1375	HU1582	x		Not eligible
1376	HU1583	x	x	Not eligible

PVA 4				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1377	HU1584	x		Not eligible
1385	HU1330	x	x	Not eligible
1387	HU1593	x	x	Not eligible
1388	HU1594	x	x	Not eligible
1389	HU1595	x	x	Undetermined
1390	HU1596	x	x	Not eligible
1391	HU1597	x	x	Not eligible
2221	HU2192	x	x	No Longer
2640	HU1326	x		Not eligible
2641	HU1327	x		Not eligible
2790	HU1331	x		Undetermined
2823	HU1573	x	x	Not eligible
2824	HU1574	x	x	Not eligible
2826	HU1575	x	x	Not eligible
2827	HU1576	x	x	Not eligible
2870	HU1572	x	x	Undetermined
2870	HU1571	x	x	Undetermined
2927	HU1577	x	x	Not eligible

PVA 5				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	HU1851	x		
	HU1813	x		
	HU1840	x		
	HU1841	x		
	HU1852	x		
	HU1811	x	x	
	HU1812	x		
421	HU1656	x		Undetermined
1291	HU760	x	x	Undetermined
1292	HU761	x	x	Undetermined
1293	HU762	x	x	Undetermined

PVA 5				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1294	HU763	x	x	Undetermined
1295	HU764	x		Undetermined
1296	HU765	x	x	Undetermined
1302	HU771	x	x	Undetermined
1303	HU772	x		Undetermined
1304	HU773	x	x	Undetermined
1305	HU774	x		Undetermined
1306	HU775	x	x	Undetermined
2518	HU2332	x		Not eligible
2519	HU2333	x		Not eligible
2520	HU2334	x		Not eligible
2521	HU2335	x	x	No Longer
2522	HU2336	x		No Longer
2687	HU2428	x	x	No Longer
3004	HU1376	x		
3011	HU1351	x		Not eligible
3570	HU2880	x		
3570	HU2879	x		
3639	HU2841	x	x	Not eligible
3849	HU2563	x		
3850	HU2564	x		
3851	HU2565	x		
3852	HU2566	x		
3854	HU2568	x		
3860	HU2574	x		
4021	HU1839	x	x	Not eligible
4024	HU1842	x	x	Not eligible
5330	HU2904	x		
5331	HU2905	x		
5332	HU2906	x	x	Not eligible
5333	HU2907	x		
5334	HU2908	x	x	
5335	HU2909	x		Not eligible

PVA 6				
Agency No.	Smithsonian No.	Historic	Prehistoric	NRHP Status
	HU1855	x	x	
	HU1856	x		
	HU1866	x		
	HU1867	x	x	
	HU1868	x	x	
	HU1869	x		
	HU1858	x	x	
	HU1862	x		
	HU1865	x	x	
	HU1861	x	x	
	HU1860	x	x	
	HU1859	x	x	
	HU1857	x	x	
351	HU23	x		Undetermined
352	HU24	x		Undetermined
353	HU25	x		Undetermined
354	HU26	x		Undetermined
354	HU26	x		Undetermined
354	HU26	x		Undetermined
355	HU27	x		Undetermined
356	HU28	x		Undetermined
357	HU29	x		Undetermined
357	HU29	x		Undetermined
363	HU35	x		Undetermined
366	HU38	x		Undetermined
368	HU40	x		Undetermined
369	HU41	x		Undetermined
392	HU1048	x	x	Undetermined
480	HU45	x		Undetermined
585	HU525	x		
614	HU903	x		Undetermined

PVA 6				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
772	HU523	x	x	Undetermined
779	HU532	x	x	Undetermined
812	HU567	x		Undetermined
954	HU1046	x	x	
1032	HU849	x	x	Undetermined
1033	HU850	x		Undetermined
1034	HU851	x		Undetermined
1035	HU852	x	x	Not eligible
1036	HU853	x	x	Undetermined
1037	HU854	x		Undetermined
3576	HU2819	x		
3579	HU2822	x	x	Not eligible
3635	HU2840	x	x	Not eligible
4003	HU1854	x	x	Not eligible

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	PE67	x		
	HU1936	x		
	HU1883	x	x	
	HU3302	x		
	HU3306	x		
	HU3305	x		
	HU3303	x		
	HU3304	x		
	HU1882	x		
	HU1801	x	x	
	HU1821	x	x	
	HU1806	x		
	HU1807	x	x	
	HU1824	x		
	PE67	x		

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	HU508	x		
	HU3307	x		
	HU1136	x	x	Other
7	HU2610	x		Not eligible
262	HU900	x		Not eligible
342	HU14	x		Undetermined
343	HU15	x		Undetermined
423	HU1658	x		Undetermined
490	HU1668	x		Undetermined
490	HU1668	x		Undetermined
492	HU626	x	x	Undetermined
493	HU627	x	x	Undetermined
494	HU628	x		Undetermined
495	HU629	x	x	Undetermined
496	HU630	x	x	Undetermined
497	HU631	x	x	Undetermined
498	HU632	x	x	Undetermined
499	HU633	x	x	Undetermined
500	HU634	x		Undetermined
501	HU635	x	x	Undetermined
502	HU636	x		Undetermined
504	HU638	x	x	Undetermined
505	HU639	x		Undetermined
506	HU640	x		Undetermined
507	HU641	x	x	Undetermined
508	HU642	x	x	Undetermined
509	HU643	x		Undetermined
510	HU644	x	x	Undetermined
511	HU652	x		Undetermined
512	HU653	x	x	Undetermined
513	HU654	x	x	Undetermined
514	HU655	x	x	Undetermined
515	HU656	x		Undetermined

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
516	HU657	x	x	Undetermined
517	HU658	x		Undetermined
518	HU659	x		Undetermined
519	HU660	x	x	Undetermined
520	HU661	x	x	Undetermined
521	HU662	x		Undetermined
522	HU663	x		Undetermined
523	HU664	x	x	Undetermined
524	HU665	x	x	Undetermined
525	HU666	x		Undetermined
526	HU667	x		Undetermined
527	HU668	x	x	Undetermined
528	HU669	x		Undetermined
529	HU670	x	x	Undetermined
530	HU671	x		Undetermined
531	HU672	x	x	Not eligible
532	HU673	x		Undetermined
533	HU674	x		Undetermined
534	HU675	x	x	Undetermined
535	HU676	x	x	Undetermined
536	HU677	x		Undetermined
537	HU678	x		Undetermined
538	HU679	x	x	Undetermined
539	HU681	x		Undetermined
540	HU682	x		Undetermined
541	HU683	x		Undetermined
542	HU684	x		Undetermined
543	HU685	x		Undetermined
544	HU686	x	x	Undetermined
545	HU687	x		Not eligible
546	HU680	x	x	Undetermined
547	HU689	x	x	Undetermined
548	HU690	x	x	Undetermined

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
549	HU691	x		Undetermined
550	HU692	x		Undetermined
551	HU693	x	x	Undetermined
552	HU694	x	x	Undetermined
553	HU695	x		Undetermined
554	HU696	x		Undetermined
555	HU697	x		Undetermined
556	HU698	x		Undetermined
557	HU699	x		Undetermined
558	HU700	x		Undetermined
559	HU701	x		Undetermined
560	HU702	x		Undetermined
561	HU703	x		Undetermined
562	HU704	x	x	Undetermined
563	HU705	x	x	Undetermined
580	HU706	x		Undetermined
595	HU707	x	x	Undetermined
596	HU708	x	x	Not eligible
597	HU709	x	x	Undetermined
598	HU710	x	x	Undetermined
599	HU711	x	x	Undetermined
600	HU712	x	x	Not eligible
601	HU713	x	x	Undetermined
602	HU714	x	x	Undetermined
603	HU715	x		Not eligible
604	HU716	x		Undetermined
605	HU717	x	x	Undetermined
606	HU718	x		Undetermined
607	HU719	x	x	Undetermined
608	HU720	x	x	Undetermined
609	HU721	x	x	Undetermined
610	HU862	x	x	Undetermined
611	HU863	x		Undetermined

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
612	HU864	x		Undetermined
642	HU2021	x	x	No Longer
644	HU991	x	x	Not eligible
645	HU992	x	x	Not eligible
646	HU993	x		Not eligible
647	HU994	x		Not eligible
648	HU995	x		Not eligible
649	HU996	x	x	Not eligible
650	HU997	x		Not eligible
651	HU998	x	x	Not eligible
652	HU999	x	x	Not eligible
653	HU1000	x	x	Not eligible
654	HU1001	x	x	Not eligible
656	HU1003	x	x	Not eligible
657	HU1004	x		Not eligible
658	HU1005	x	x	Not eligible
660	HU1007	x	x	Not eligible
661	HU1008	x	x	Not eligible
662	HU1009	x	x	Not eligible
663	HU1010	x	x	Not eligible
664	HU1011	x		Not eligible
673	HU1051	x		
674	HU1052	x		Undetermined
675	HU1053	x		Not eligible
676	HU1054	x		Not eligible
677	HU1055	x		Not eligible
678	HU1056	x		Not eligible
679	HU1057	x		Not eligible
680	HU1058	x	x	Not eligible
681	HU1059	x	x	Not eligible
682	HU1060	x		Not eligible
683	HU1061	x		Not eligible
684	HU1062	x	x	Not eligible

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
685	HU1063	x		Not eligible
686	HU1064	x		Not eligible
687	HU1065	x	x	Not eligible
688	HU1066	x		Not eligible
689	HU1067	x		Not eligible
690	HU1068	x		Undetermined
691	HU1069	x		Undetermined
692	HU1070	x		Undetermined
693	HU1071	x		Not eligible
694	HU1072	x		Not eligible
695	HU1073	x		Undetermined
696	HU1047	x		Not eligible
697	HU1075	x		Not eligible
698	HU1076	x		Not eligible
699	HU1077	x		Not eligible
700	HU1078	x	x	Not eligible
701	HU1079	x	x	Not eligible
702	HU1080	x		Not eligible
703	HU1081	x		Not eligible
704	HU1082	x		Not eligible
705	HU1083	x		Not eligible
706	HU1084	x		Not eligible
707	HU1085	x	x	Not eligible
708	HU1086	x	x	Not eligible
757	HU506	x	x	Undetermined
758	HU507	x	x	Undetermined
811	HU566	x	x	Undetermined
813	HU568	x	x	Undetermined
814	HU569	x	x	Undetermined
827	HU1013	x	x	Undetermined
828	HU1014	x	x	Undetermined
829	HU1015	x	x	Undetermined
830	HU1016	x	x	Undetermined

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
831	HU1017	x	x	Undetermined
832	HU1018	x	x	Undetermined
833	HU1019	x	x	Undetermined
834	HU1020	x	x	Undetermined
835	HU1021	x		Undetermined
836	HU1022	x		Undetermined
923	HU1137	x		No Longer
923	HU1137	x		No Longer
924	HU1138	x	x	No Longer
925	HU1139	x		No Longer
926	HU1140	x		No Longer
927	HU1141	x	x	No Longer
928	HU1142	x	x	No Longer
929	HU1143	x		No Longer
930	HU1144	x		No Longer
931	HU1145	x		No Longer
932	HU1146	x		Not eligible
933	HU1147	x	x	Not eligible
934	HU1148	x	x	Not eligible
935	HU1149	x	x	Not eligible
936	HU1150	x	x	Not eligible
937	HU1151	x	x	Not eligible
938	HU1152	x	x	Not eligible
939	HU1153	x	x	Not eligible
940	HU1154	x	x	Not eligible
941	HU1155	x		Not eligible
942	HU1156	x	x	Not eligible
943	HU1157	x		Not eligible
943	HU1157	x		Not eligible
944	HU1158	x	x	Not eligible
945	HU1159	x		Not eligible
946	HU1160	x	x	Not eligible
947	HU1161	x	x	Not eligible

PVA 7				
Agency No.	Smithsonian No.	Historic	Prehistoric	NRHP Status
948	HU1162	x		Not eligible
949	HU1163	x		Not eligible
950	HU1164	x		Not eligible
951	HU1165	x		Not eligible
952	HU1166	x		Not eligible
953	HU1167	x	x	Not eligible
1007	HU1169	x	x	No Longer
1026	HU1108	x	x	Undetermined
1122	HU2023	x	x	Not eligible
1123	HU2031	x		
1127	HU2025	x	x	No Longer
1128	HU2026	x	x	Not eligible
1487	HU861	x		Undetermined
1488	HU480	x	x	Undetermined
1489	HU481	x	x	Undetermined
1490	HU486	x		Undetermined
1492	HU488	x	x	Undetermined
1493	HU489	x	x	Undetermined
1494	HU490	x	x	No Longer
1495	HU491	x		Undetermined
1496	HU492	x	x	Undetermined
1497	HU493	x		Undetermined
1498	HU494	x	x	Undetermined
1499	HU495	x	x	Undetermined
1500	HU496	x	x	Undetermined
1501	HU497	x	x	Undetermined
1683	HU2390	x		
1737	HU482	x		Undetermined
1738	HU483	x		Undetermined
1739	HU484	x	x	Undetermined
1740	HU485	x		Undetermined
1771	HU589	x		
1772	HU590	x		

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1773	HU591	x		
1774	HU592	x		
1775	HU593	x		
1871	HU597	x		No Longer
1895	HU586	x		Undetermined
1896	HU587	x		Undetermined
1910	HU2317	x		No Longer
2010	HU2101	x	x	Undetermined
2120	HU2199	x		
2196	HU2179	x	x	Not eligible
2197	HU2180	x	x	Not eligible
2198	HU2181	x		No Longer
2199	HU2182	x	x	No Longer
2291	HU2353	x	x	No Longer
2292	HU2354	x	x	No Longer
2488	HU1345	x	x	Not eligible
2661	HU1307	x		Not eligible
2710	HU1356	x		Undetermined
2783	HU2356	x	x	Undetermined
2784	HU2357	x		Undetermined
2785	HU2358	x	x	Undetermined
2786	HU2359	x	x	Undetermined
2787	HU2360	x	x	Undetermined
2788	HU2361	x	x	Undetermined
2806	HU56	x	x	No Longer
2855	HU1346	x		No Longer
2899	HU2364	x		Not eligible
2919	HU2198	x	x	Undetermined
2920	HU2199		x	Undetermined
2921	HU2200	x		Undetermined
2922	HU2201	x	x	Undetermined
2923	HU2202	x	x	Undetermined
2924	HU2203	x		Undetermined

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
2927	HU1577	x	x	Not eligible
2928	HU1368	x		
3005	HU2413	x		
3006	HU2414	x		
3007	HU2415	x		
3019	HU1760	x	x	Not eligible
3079	HU1761	x		Potentially
3080	HU2604	x		Potentially
3081	HU2605	x		Potentially
3082	HU2606	x		Potentially
3083	HU2607	x		Potentially
3084	HU2608	x		Not eligible
3085	HU2609	x		Not eligible
3087	HU2611	x		Not eligible
3088	HU2612	x		Not eligible
3089	HU2613	x	x	Not eligible
3090	HU2614	x	x	Not eligible
3091	HU2615	x		Not eligible
3092	HU2616	x	x	Not eligible
3093	HU1762	x	x	Potentially
3094	HU1763	x	x	Not eligible
3095	HU2617	x	x	Not eligible
3096	HU2618	x	x	Not eligible
3097	HU2619	x	x	Not eligible
3098	HU2620	x	x	Not eligible
3099	HU2621	x		Not eligible
3100	HU2622	x		Not eligible
3101	HU2623	x	x	Not eligible
3102	HU2624	x	x	Not eligible
3180	HU2418	x	x	Not eligible
3198	HU2737	x		Not eligible
3259	HU2755	x		
3323	HU2433	x	x	

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
3324	HU2434	x		Eligible
3325	HU2435	x		Not eligible
3326	HU2436	x	x	
3327	HU2437	x	x	Eligible
3328	HU2438	x	x	Not eligible
3329	HU2439	x	x	Eligible
3330	HU2440	x	x	
3331	HU2441	x		
3332	HU2442	x		
3333	HU1853	x	x	
3408	HU1802	x	x	Other
3409	HU1803	x	x	
3410	HU1804	x	x	
3411	HU1805	x	x	Other
3417	HU2805	x		
3418	HU2806	x		
3435	HU2625	x		
3438	HU2628	x		
3440	HU2630	x	x	Not eligible
3444	HU2634	x		Not eligible
3446	HU2636	x		
3447	HU2637	x	x	
3448	HU2638	x		
3455	HU2645	x		Not eligible
3460	HU2650	x		
3466	HU2655	x		
3467	HU2656	x		
3468	HU2657	x		
3469	HU2658	x		
3470	HU2594	x		
3471	HU2659	x		Not eligible
3472	HU2660	x		
3473	HU2661	x	x	

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
3474	HU2662	x	x	
3475	HU2663	x		
3476	HU2664	x	x	
3477	HU2665	x	x	
3478	HU2666	x	x	
3479	HU2667	x		
3480	HU2668	x	x	
3481	HU2669	x	x	Not eligible
3482	HU2670	x		
3483	HU2671	x		
3485	HU2673	x		
3486	HU2674	x		
3487	HU2675	x		
3488	HU2676	x		
3489	HU2677	x	x	
3490	HU2678	x		
3491	HU2679	x		
3492	HU2680	x		
3493	HU2681	x		
3494	HU2682	x		
3495	HU2595	x	x	
3496	HU2683	x		
3497	HU2684	x	x	
3498	HU2685	x	x	Not eligible
3499	HU2686	x	x	
3500	HU2596	x		
3501	HU2687	x		
3502	HU2688	x		
3503	HU2689	x	x	
3504	HU2690	x	x	
3505	HU2691	x	x	
3579	HU864		x	Not eligible
3609	HU2829	x	x	Not eligible

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
3610	HU2830	x	x	Not eligible
3611	HU2831	x	x	
3612	HU2832	x		
3614	HU2834	x		
3615	HU2835	x		
3640	HU2826	x		
3672	HU1822	x	x	Eligible
3676	HU2449	x	x	
3677	HU2450	x	x	Eligible
3679	HU2452	x		
3680	HU2453	x		Not eligible
3681	HU2454	x	x	Not eligible
3682	HU2455	x	x	
3683	HU2456	x	x	
4037	HU3291	x		Not eligible
4038	HU3292	x		Not eligible
4082	HU2885	x		
4083	HU2886	x		
4084	HU2887	x		
4085	HU2888		x	Not eligible
4086	HU2888	x		
4087	HU2889	x		
4088	HU2890	x		Not eligible
4089	HU2891	x		Not eligible
4090	HU2892	x		Not eligible
4091	HU2893	x		
4092	HU2894	x		Not eligible
4093	HU2895	x		Not eligible
4094	HU2896	x		
4095	HU2897	x		Not eligible
4096	HU2898	x		
4097	HU2899	x		Not eligible
4098	HU2900	x		

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
4126	HU2913	x		
4242	HU3551	x	x	
4360	HU3547	x	x	
4363	HU3550	x		
4449	HU1881	x	x	Eligible
4539	HU2517	x		
4590	HU3299	x	x	Eligible
4672	HU3517	x	x	
4673	HU3518	x		
4674	HU3519	x	x	
4675	HU3520	x		
4676	HU3521	x	x	
4677	HU3522	x		
4678	HU3523	x	x	
4679	HU3524	x	x	
4700	HU3545	x	x	Not eligible
4702	HU2939	x		
4703	HU2940	x		
4704	HU2941	x		Not eligible
4705	HU2942	x		Not eligible
4706	HU2943	x		
4707	HU2944	x		
4708	HU2945	x		Not eligible
4709	HU2946	x		
4710	HU2947	x		Not eligible
4711	HU2948	x		Not eligible
4712	HU2949	x		
4713	HU2950	x		Not eligible
4982	HU3515	x		
5147	HU3176	x		
5148	HU3177	x		
5150	HU3179	x		
5151	HU3180	x		

PVA 7				
Agency No.	Smithsonian No.	Historic	Prehistoric	NRHP Status
5152	HU3181	x		
5153	HU3182	x		
5154	HU3183	x		
5155	HU3184	x	x	
5159	HU3185	x		
5160	HU3186	x		
5161	HU3187	x		
5162	HU3188	x		
5281	HU3145	x		
5282	HU3146	x	x	Not eligible
5283	HU3147	x		
5284	HU3148	x		
5285	HU3149	x	x	
5286	HU3150	x		
5287	HU3151	x		
5288	HU3152	x		
5308	HU3153	x		
5337	HU2960	x	x	Not eligible
5338	HU2961	x		
5339	HU2962	x		Not eligible
5340	HU2963	x		
5341	HU2964	x	x	Not eligible
5342	HU2965	x		Not eligible
5343	HU2966	x		Not eligible
5344	HU2967	x		
5345	HU2968	x	x	
5346	HU2969	x		
5347	HU2970	x		Not eligible
5348	HU2971	x	x	
5349	HU2972	x		
5350	HU2973	x	x	
5351	HU2974	x		
5352	HU2975	x		Not eligible

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
5353	HU2976	x		Not eligible
5359	HU2959	x	x	
5439	HU2936	x		Not eligible
5526	HU3136	x		
5544	HU3154	x		Undetermined
5545	HU3155	x		Undetermined
5546	HU3156	x		Eligible
5547	HU3157	x		Not eligible
5548	HU3158	x	x	Not eligible
5549	HU3159	x		Not eligible
5553	HU3163	x		Not eligible
5554	HU3164	x		Not eligible
5555	HU3165	x		
5556	HU3136		x	Undetermined
5557	HU3166	x		Not eligible
5558	HU3167	x		Eligible
5559	HU3168	x		Eligible
5560	HU3169	x		Not eligible
5561	HU3170	x		Not eligible
5562	HU3171	x		Eligible
5563	HU3172	x		Not eligible
5564	HU3173	x		Not eligible
5565	HU3174	x		Not eligible
5566	HU3175	x		Not eligible
5570	HU3144	x	x	Eligible
5800	HU2451	x	x	Not eligible
5934	HU3141	x	x	Not eligible
5935	HU3142	x		
6375	HU3402	x	x	Not eligible
6376	HU3403	x	x	Eligible
6378	HU3405	x		Not eligible
6421	HU3317	x		
6422	HU3318	x	x	Not eligible

PVA 7				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
6423	HU3319	x		
6424	HU3320	x		

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	PE3	x		
	PE2202	x		
	PE2256	x	x	Not eligible
	PE2345	x		
	PE2379	x		
	PE2380	x		
2	WA2238	x	x	Undetermined
31	WA2250	x	x	Undetermined
32	WA2249	x	x	Not eligible
33	WA1421	x	x	Undetermined
34	WA2251	x	x	Not eligible
35	WA2252	x	x	Undetermined
36	WA2253	x	x	Not eligible
37	WA2254	x		Not eligible
38	WA2255	x	x	Not eligible
39	WA2256	x	x	Not eligible
40	WA2257	x		Not eligible
41	WA2258	x		Not eligible
42	WA2259	x		Not eligible
43	WA2271	x		Not eligible
44	WA2272	x		Not eligible
45	WA2273	x		Not eligible
46	WA2274	x		Not eligible
47	WA2275	x		Not eligible
48	WA2276	x		Not eligible
49	WA2277	x		Not eligible
52	WA2284	x		Not eligible

PVA 8				
Agency No.	Smithsonian No.	Historic	Prehistoric	NRHP Status
53	WA2285	x		Not eligible
58	WA2144	x	x	Undetermined
67	WA2286	x	x	Not eligible
68	WA2287	x		Not eligible
69	WA2288	x		Not eligible
70	WA2289	x		Not eligible
71	WA2290	x		Not eligible
72	WA2291	x	x	Not eligible
73	WA2292	x		Not eligible
74	WA2293	x		Not eligible
75	WA2294	x		Not eligible
76	WA2295	x	x	Not eligible
77	WA2296	x		Not eligible
78	WA2297	x	x	Not eligible
79	WA2298	x		Not eligible
80	WA2299	x		Not eligible
81	WA2300	x		Not eligible
82	WA2301	x		Not eligible
83	WA2302	x	x	Not eligible
84	WA2303	x		Not eligible
85	WA2304	x	x	Not eligible
86	WA2305	x		Not eligible
87	WA2278	x	x	Undetermined
106	WA2306	x		Not eligible
107	WA2307	x		Not eligible
108	WA2308	x		Not eligible
109	WA2309	x		Not eligible
110	WA2310	x		Not eligible
111	WA2311	x		Not eligible
112	WA2312	x		Not eligible
113	WA2313	x	x	Not eligible
114	WA2314	x		Not eligible
115	WA2315	x	x	Not eligible

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
116	WA2316	x		Not eligible
117	WA2317	x		Not eligible
118	WA2318	x		Not eligible
119	WA2319	x	x	Not eligible
120	WA2320	x		Not eligible
121	WA2321	x		Not eligible
122	WA2322	x		Not eligible
123	WA2323	x		Undetermined
124	WA2324	x	x	Undetermined
125	WA2325	x		Undetermined
135	CH315	x	x	Undetermined
136	CH316	x		Undetermined
137	CH202	x	x	Eligible
138	CH317	x	x	Undetermined
139	CH318	x	x	Undetermined
140	WA201	x	x	Not eligible
141	WA202	x	x	Undetermined
142	WA204	x	x	Not eligible
143	WA205	x	x	Not eligible
144	WA206	x		Not eligible
145	WA207	x		Not eligible
146	WA208	x		Potentially
146	WA208	x		Potentially
147	WA209	x		Undetermined
148	WA210	x	x	Undetermined
149	WA211	x		Undetermined
151	CH319	x		Not eligible
157	CH325	x		Not eligible
159	CH327	x		Not eligible
160	CH328	x		Not eligible
161	CH329	x		Not eligible
161	CH329	x		Not eligible
176	WA196	x	x	Undetermined

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
177	WA197	x		Undetermined
178	WA198	x	x	Eligible
179	WA199	x	x	Not eligible
180	WA200	x	x	Potentially
183	WA203	x	x	Undetermined
196	CH338	x		Not eligible
197	CH339	x		Not eligible
198	CH340	x		Not eligible
199	CH341	x		Not eligible
200	CH342	x		Not eligible
201	CH343	x	x	Not eligible
202	CH344	x		Not eligible
203	CH345	x	x	Not eligible
204	CH346	x		Not eligible
228	CH507	x		Undetermined
229	WA2327	x		Eligible
231	CH331	x		Eligible
240	CH337	x		Eligible
260	PE532	x		Not eligible
261	PE533	x	x	Not eligible
383	WA2502	x	x	Undetermined
384	WA2503	x		Undetermined
385	WA2504	x	x	Undetermined
386	WA2088	x	x	Undetermined
387	WA2089	x	x	Undetermined
451	PE2155	x		Undetermined
452	PE2156	x		Undetermined
453	PE535	x	x	Not eligible
455	PE2158	x		Undetermined
462	PE2164	x		
468	PE2169	x		Undetermined
474	CH365	x	x	Undetermined
475	PE526	x	x	

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
477	PE528	x	x	Undetermined
575	WA2525	x		Not eligible
576	WA2526	x	x	Not eligible
577	WA2527	x		Not eligible
578	WA2528	x		Not eligible
616	PE567	x		Not eligible
617	PE568	x	x	Not eligible
621	PE572	x	x	Not eligible
624	WA2598	x	x	Not eligible
625	WA2629	x	x	Not eligible
626	WA2630	x	x	Not eligible
627	WA2631	x		Not eligible
628	WA2632	x	x	Not eligible
629	WA2633	x	x	Not eligible
630	WA2634	x		Not eligible
631	WA2635	x		
632	WA2636	x	x	Not eligible
633	WA2637	x	x	Not eligible
634	WA2638	x	x	Not eligible
635	WA2639	x	x	Not eligible
636	WA2640	x		Not eligible
637	WA2641	x		Not eligible
638	WA2642	x		Not eligible
639	WA2643	x		Not eligible
709	PE587	x		Not eligible
710	PE588	x		Not eligible
711	PE589	x		Not eligible
712	PE590	x		Not eligible
713	PE591	x		Not eligible
714	PE592	x		Not eligible
715	PE593	x		Not eligible
716	PE594	x		Not eligible
718	PE596	x		Not eligible

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
719	PE597	x	x	Not eligible
720	PE598	x	x	Undetermined
721	PE599	x	x	Not eligible
722	PE600	x	x	Eligible
723	PE601	x	x	Not eligible
724	PE602	x	x	Undetermined
725	PE603	x	x	Not eligible
726	PE604	x	x	Not eligible
727	PE605	x		Not eligible
736	CH574	x		Not eligible
840	CH508	x	x	Potentially
841	CH509	x		Registered
842	CH510	x		Potentially
843	CH511	x	x	Not eligible
852	CH520	x		Not eligible
853	CH521	x	x	Not eligible
854	CH522	x	x	Not eligible
855	CH523	x		Not eligible
856	CH524	x		Not eligible
857	CH525	x	x	No Longer
858	CH526	x	x	Not eligible
859	CH527	x		Not eligible
860	CH528	x	x	Not eligible
861	CH529		x	Not eligible
862	CH530	x	x	No Longer
863	CH531	x	x	Not eligible
864	CH529	x		Not eligible
865	CH533	x	x	No Longer
867	CH535	x		Not eligible
873	PE613	x		Not eligible
874	PE614	x		Not eligible
875	PE615	x		Not eligible
876	PE616	x		

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
877	PE617	x		Not eligible
878	PE618	x		Not eligible
879	PE619	x	x	Not eligible
880	PE620	x		
881	PE118	x	x	Not eligible
882	PE622	x	x	Not eligible
883	PE623	x	x	Not eligible
894	PE634	x	x	Not eligible
899	PE639	x	x	Not eligible
900	PE640	x		Not eligible
902	WA2649	x		Not eligible
1009	PE651	x	x	Not eligible
1126	WA2650	x	x	No Longer
1141	PE997	x	x	Not eligible
1142	PE998	x	x	Not eligible
1143	PE999	x	x	Not eligible
1144	PE1000	x		Not eligible
1145	PE1001	x		Not eligible
1165	CH183	x	x	Undetermined
1166	CH470	x	x	Undetermined
1167	CH468	x	x	Undetermined
1168	CH469	x	x	Undetermined
1169	CH471	x	x	Undetermined
1170	CH181	x	x	Undetermined
1171	CH182	x		Undetermined
1172	CH184	x		Undetermined
1173	CH366	x	x	Undetermined
1174	CH472	x	x	Undetermined
1196	WA2654	x	x	No Longer
1199	PE561	x	x	Undetermined
1203	WA2582	x		Undetermined
1211	WA3133	x	x	Not eligible
1212	WA3131	x	x	Potentially

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1213	WA3132	x		Not eligible
1229	WA2986	x		Not eligible
1230	WA2987	x		Not eligible
1231	WA2488	x	x	Not eligible
1232	WA2988	x	x	Not eligible
1233	WA2989	x	x	Not eligible
1245	WA2863	x	x	Not eligible
1247	WA2865	x		Not eligible
1250	WA2868	x		Not eligible
1251	WA2869	x		Not eligible
1264	WA2882	x		Not eligible
1265	WA2883	x		Not eligible
1266	WA2884	x	x	Not eligible
1267	WA2885	x		Not eligible
1268	WA2886	x		Not eligible
1269	WA2887	x		Not eligible
1270	WA2885		x	Not eligible
1271	WA2889	x		Not eligible
1272	WA2890	x		Not eligible
1273	WA2891	x	x	Not eligible
1274	WA2892	x	x	Not eligible
1275	WA2893	x	x	Not eligible
1276	WA2894	x		Not eligible
1281	WA2899	x		Not eligible
1282	WA2900	x	x	Not eligible
1283	WA2901	x		Not eligible
1284	WA2902	x	x	No Longer
1285	WA2903	x		Not eligible
1286	WA2904	x	x	No Longer
1287	WA2905	x		Not eligible
1309	PE42	x	x	Undetermined
1310	PE46	x		Undetermined
1311	PE47	x		Undetermined

PVA 8				
Agency No.	Smithsonian No.	Historic	Prehistoric	NRHP Status
1312	PE48	x		Undetermined
1313	PE49	x		Undetermined
1314	PE4	x		Undetermined
1315	PE45	x		Undetermined
1315	PE2	x		Undetermined
1324	WA2990	x		Not eligible
1370	WA1656	x	x	Undetermined
1441	PE342	x		
1441	PE342	x		
1897	CH901	x		Not eligible
1920	PE996	x		Potentially
1985	CH671	x		Not eligible
1986	CH672	x		Not eligible
1987	CH673	x		Not eligible
1988	CH674	x	x	Potentially
1989	CH675	x		Not eligible
2013	PE2175	x	x	Not eligible
2015	PE2176	x	x	Undetermined
2021	PE933	x	x	No Longer
2172	PE2178	x		Other
2182	CH902	x		Undetermined
2219	CH599	x	x	No Longer
2277	WA2918	x	x	Not eligible
2287	PE828	x	x	No Longer
2343	PE850	x	x	Not eligible
2409	WA2930	x	x	No Longer
2410	WA2931	x		Not eligible
2411	WA2932	x		Not eligible
2412	WA2933	x	x	Not eligible
2413	WA2934	x	x	Not eligible
2414	WA2935	x	x	Not eligible
2415	WA2936	x	x	Not eligible
2416	WA2937	x	x	Not eligible

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
2417	WA2938	x	x	No Longer
2418	WA2939	x		Not eligible
2419	WA2940	x		Not eligible
2420	WA2941	x		Not eligible
2421	WA2942	x		Not eligible
2422	WA2943	x		Not eligible
2423	WA2944	x		Undetermined
2424	WA2945	x		Not eligible
2425	WA2946	x		Not eligible
2426	WA2947	x	x	Not eligible
2427	WA2948	x		Not eligible
2428	WA2949	x		Not eligible
2429	WA2950	x	x	Not eligible
2430	WA2951	x	x	Not eligible
2431	WA2953		x	Not eligible
2432	WA2953	x		Not eligible
2433	WA2954	x		Not eligible
2434	WA2955	x	x	Not eligible
2435	WA2956	x	x	Not eligible
2494	PE873	x	x	Other
2495	PE874	x		Other
2496	PE875	x	x	No Longer
2532	WA2758	x		Undetermined
2533	WA2759	x	x	
2534	WA2760	x	x	Undetermined
2535	WA2761	x	x	Undetermined
2536	WA2762	x	x	Undetermined
2558	WA3160	x	x	Not eligible
2559	WA3161	x	x	Potentially
2560	WA3162	x		Not eligible
2561	WA3163	x		Not eligible
2562	WA3164	x		Not eligible
2563	WA3165	x	x	Eligible

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
2564	WA3166	x	x	Not eligible
2565	WA3167	x		Not eligible
2566	WA3168	x	x	Not eligible
2567	WA3169	x	x	Not eligible
2568	WA3170	x	x	Not eligible
2569	WA3171	x	x	Not eligible
2570	WA3172	x	x	Not eligible
2571	WA3173	x		Not eligible
2572	WA3174	x		Not eligible
2573	WA2924	x	x	Eligible
2574	WA3175	x	x	Not eligible
2575	WA3176	x	x	Not eligible
2576	WA3177	x	x	Eligible
2577	WA3178	x	x	Not eligible
2578	WA3179	x		Not eligible
2579	WA3180	x		Not eligible
2580	WA3181	x	x	Potentially
2581	WA3182	x		Eligible
2617	WA2668	x		Eligible
2618	PE740	x	x	
2619	PE2127	x		No Longer
2644	WA2908	x	x	Undetermined
2716	WA3012	x	x	Eligible
2753	WA3143	x	x	Not eligible
2754	WA3144	x		Not eligible
2755	WA2910	x	x	Undetermined
2795	WA3142	x	x	Undetermined
2857	WA3009	x	x	Undetermined
2858	WA3011	x	x	Undetermined
2871	PE1007	x	x	No Longer
2872	PE1008	x	x	Eligible
2961	PE987	x		Eligible
2962	PE988	x		Other

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
2963	PE989	x	x	Not eligible
2964	PE990	x		Other
2965	PE991	x		Eligible
2966	PE992	x		Not eligible
2967	PE993	x	x	Eligible
2990	WA3130	x	x	Undetermined
2993	PE1004	x	x	Not eligible
2994	PE1005	x		
2995	PE1006	x	x	Not eligible
3334	22-3334	x	x	Not eligible
3754	CH1074	x	x	Not eligible
3755	CH1075	x		Undetermined
3903	PE2273	x		
3904	PE2274	x		
3905	PE2275	x		
3908	PE2278	x	x	Eligible
3909	PE2276	x		
4048	WA3344	x	x	Undetermined
4054	WA3350	x		Not eligible
4055	WA3351	x		Not eligible
4057	WA3354	x	x	Undetermined
4060	WA3357	x		Undetermined
4181	WA3743	x	x	Eligible
4594	PE812	x		
4601	PE2249	x		Not eligible
4602	PE2250	x		
4660	PE2251	x		
4661	PE2252	x		
4662	PE2253	x		Not eligible
4663	PE2254	x		
4664	PE2255	x	x	
4665	PE2301	x		Undetermined
5123	WA4711	x	x	Registered

PVA 8				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
5493	WA5345	x	x	Not eligible
5494	WA5346	x		Not eligible
5495	WA5347	x	x	Not eligible
5574	22-5574	x		Not eligible
5576	22-5576	x		Not eligible
5693	22-5693	x		Not eligible
6760	22-6760	x		Not eligible
6761	22-6761	x	x	Not eligible
6814	WA6409	x	x	Eligible
6944	22-6944	x		
6945	22-6945	x		
6946	22-6946	x		
6947	22-6947	x		
6948	22-6948	x		
6949	22-6949	x		
6950	22-6950	x		
6952	22-6952	x		
6954	22-6954	x		
6960	22-6960	x		
6962	22-6962	x		

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	PE7	x		
	PE119	x		
	PE348	x		
	PE349	x		
	PE351	x	x	
	PE352	x		
	PE364	x		
	PE369	x		
	PE428	x		

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	PE450	x	x	Eligible
	PE456	x		Not eligible
	PE457	x	x	Not eligible
	PE458	x		Not eligible
	PE477	x		Not eligible
	PE481	x		
	PE482	x		
	PE483	x		
	PE484	x		Not eligible
	PE575	x		Not eligible
	PE732	x	x	
	PE947	x	x	Other
	PE948	x		Other
	PE949	x	x	Other
	PE950	x	x	Not eligible
	PE951	x	x	Not eligible
	PE952	x		
	PE953	x		Other
	PE954	x	x	Eligible
	PE955	x	x	Other
	PE956	x	x	Other
	PE957	x		Other
	PE2208	x		
	PE2244	x		
	PE2259	x		Not eligible
	PE2261	x		
	PE2264	x		
	PE2265	x		
	PE2266	x		
	PE2269	x		
	PE2271	x		
	PE2272	x		
	PE2343	x		

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	PE2344	x		
	PE2375	x		Not eligible
	PE2376	x	x	Not eligible
	PE2377	x		Not eligible
	PE2378	x		Not eligible
205	PE455	x		Eligible
220	PE478	x	x	Other
221	PE479	x	x	Not eligible
222	PE480	x		Not eligible
223	PE481		x	Not eligible
227	PE485	x	x	Not eligible
232	PE469	x		Undetermined
244	PE2138	x		Undetermined
244	PE2138	x		Undetermined
388	PE575		x	Undetermined
389	PE576	x		Other
390	PE577	x		Undetermined
391	PE578	x	x	Other
394	PE579	x		Eligible
395	PE2142	x		Not eligible
404	PE2147	x		Not eligible
405	PE2148	x		Undetermined
408	PE580	x		Other
448	PE2152	x		
450	PE2154	x		
458	PE2161	x		
459	PE2162	x		Undetermined
470	PE2171	x		Not eligible
822		x		Eligible
837	PE583	x		Not eligible
838	PE584	x	x	Other
839	PE585	x		Other
1006	PE649	x	x	No Longer

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1153	PE691	x	x	Undetermined
1210	PE128	x	x	
1316	PE549	x	x	Undetermined
1320	PE68	x		Undetermined
1322	PE70	x		Undetermined
1323	PE71	x		Undetermined
1324	PE72	x	x	Undetermined
1325	PE73	x		Undetermined
1326	PE74	x	x	
1327	PE75	x	x	Undetermined
1328	PE76	x		Undetermined
1329	PE77	x	x	Undetermined
1330	PE78	x		Undetermined
1342	PE34	x	x	Undetermined
1346	PE56	x		
1347	PE57	x		Undetermined
1348	PE58	x		
1441	PE324	x		Undetermined
1441	PE324	x		Undetermined
1445	PE312	x	x	
1446	PE313	x	x	
1447	PE314	x	x	Undetermined
1448	PE315	x	x	
1449	PE316	x	x	
1450	PE317	x	x	Undetermined
1451	PE318	x	x	
1452	PE319	x	x	Undetermined
1453	PE320	x	x	Undetermined
1454	PE321	x	x	Undetermined
1457	PE311	x	x	Other
1458	PE323	x	x	Undetermined
1459	PE324		x	
1460	PE325	x	x	

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1461	PE326	x	x	
1467	PE537	x	x	Undetermined
1468	PE542	x	x	Undetermined
1742	PE680	x	x	
1743	PE681	x	x	
1744	PE682	x	x	
1745	PE683	x	x	
1746	PE684	x	x	
1747	PE685	x		
1748	PE686	x		Undetermined
1749	PE687	x		
1750	PE688	x	x	
1751	PE689	x	x	
1752	PE690	x		Undetermined
1754	PE692	x		Undetermined
1767	PE705	x		
1768	PE706	x	x	
1769	PE707	x	x	Undetermined
1770	PE708	x	x	
1777	PE710	x		
1778	PE709	x		
1789	PE372	x	x	
1790	PE382	x	x	
1792	PE384	x		
1793	PE370	x		
1793	PE370	x		
1794	PE385	x		
1795	PE386	x		
1796	PE381	x	x	Undetermined
1797	PE387	x	x	
1798	PE389	x		
1799	PE392	x		Undetermined
1800	PE393	x		Undetermined

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1801	PE394	x	x	
1802	PE395	x		
1803	PE396	x		
1804	PE397	x	x	
1805	PE398	x		
1806	PE399	x		
1807	PE391	x		
1808	PE451	x		Undetermined
1809	PE400	x		
1810	PE401	x		Undetermined
1811	PE402	x	x	
1812	PE404	x	x	
1813	PE403	x		Undetermined
1814	PE405	x		
1815	PE406	x	x	
1819	PE410	x		
1820	PE411	x		
1821	PE412	x		
1822	PE413	x		
1823	PE414	x		
1824	PE415	x	x	
1825	PE416	x		
1826	PE417	x		
1827	PE418	x	x	
1828	PE419	x	x	
1829	PE420	x	x	
1830	PE421	x		
1831	PE422	x		
1832	PE423	x		
1833	PE424	x	x	
1834	PE425	x		
1835	PE426	x		
1836	PE453	x		No Longer

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1837	PE429	x		
1837	PE429	x		
1838	PE430	x	x	
1839	PE431	x		
1840	PE432	x		
1841	PE433	x		
1842	PE449	x		
1843	PE448	x	x	
1844	PE447	x		Undetermined
1845	PE446	x		
1846	PE445	x		
1851	PE440	x		
1852	PE439	x		
1853	PE438	x	x	
1861	PE377	x	x	
1862	PE376	x	x	
1863	PE374	x		
1864	PE454	x		No Longer
1865	PE373	x	x	Undetermined
1873	PE2174	x		
1873	PE2174	x		
1880	PE350	x	x	
2205	PE716	x		No Longer
2206	PE717	x		No Longer
2207	PE718	x		Other
2208	PE719	x	x	No Longer
2209	PE720	x		Other
2211	PE722	x		No Longer
2212	PE723	x	x	Other
2213	PE724	x	x	No Longer
2214	PE725	x	x	No Longer
2217	PE728	x	x	No Longer
2218	PE729	x	x	No Longer

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
2226	PE365	x	x	Eligible
2227	PE366	x	x	Undetermined
2228	PE388	x	x	Eligible
2229	PE390	x		Eligible
2275	PE820	x	x	Not eligible
2456	PE2024	x		
2457	PE2025	x		
2458	PE2026	x		
2459	PE2027	x		
2460	PE2028	x	x	
2461	PE345	x		
2462	PE2029	x	x	
2463	PE2030	x		
2464	PE2031	x		
2465	PE2032	x	x	
2466	PE2033	x		
2467	PE2034	x	x	
2468	PE2035	x	x	
2623	PE897	x		No Longer
2626	PE2023	x		
2645	PE2096	x		
2646	PE2097	x		Other
2647	PE2098	x		Not eligible
2654	PE2102	x	x	Other
2655	PE2103	x		
2656	PE2104	x		
2773	PE2338	x		
2886	PE965	x	x	Not eligible
2887	PE1009	x	x	No Longer
2888	PE1010	x		Eligible
2892	PE921	x	x	Other
2893	PE922	x		Undetermined
2929	PE2019	x		

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
2996	PE2116	x		Other
2997	PE2117	x		Other
2998	PE2118	x	x	Not eligible
2999	PE2119	x		Other
3069	PE2037	x	x	Eligible
3342	PE2260	x	x	
3345	PE2262	x	x	Eligible
3348	PE2267	x		Eligible
3350	PE2268	x	x	
3353	PE2270	x	x	Eligible
3560	PE1020	x	x	Not eligible
3813	PE751	x		
3814	PE752	x		
3815	PE753	x		Not eligible
3816	PE754	x	x	
3817	PE755	x		Eligible
3968	PE762	x		
3989	PE2386	x	x	Undetermined
4252	PE2316	x		Not eligible
4254	PE2318	x		
4583	PE814	x	x	Not eligible
4584	PE813	x		
4606	PE1045	x	x	Not eligible
4607	PE1046	x		Not eligible
4608	PE1047	x		Not eligible
4609	PE1048	x		Not eligible
4610	PE1043	x	x	
4611	PE1044	x	x	
4767	PE2182	x		
4768	PE2183	x		
5011	PE2241	x		
5324		x		
5325		x		

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
5326		x		Not eligible
5415		x		
5447	PE2358	x		Not eligible
5448	PE2359	x	x	Not eligible
5449	PE2360	x	x	Not eligible
5450	PE2361	x		Not eligible
5451	PE2362	x		Not eligible
5452	PE2363	x		Not eligible
5453	PE2364	x		Not eligible
5454	PE2365	x		Not eligible
5455	PE2366	x	x	Not eligible
5456	PE2367	x	x	Not eligible
5457	PE2368	x		Not eligible
5458	PE2369	x	x	Not eligible
5459	PE2370	x		Not eligible
5577		x		Not eligible
5607		x	x	Not eligible
5618		x		Not eligible
5621		x		Not eligible
5622		x		Not eligible
6136		x	x	Eligible
6137		x	x	Eligible
6138		x		Not eligible
6139		x		Not eligible
6299		x	x	Not eligible
6300		x	x	Not eligible
6301		x	x	Not eligible
6302		x	x	Not eligible
6303		x		Not eligible
6304		x	x	Not eligible
6305		x	x	Not eligible
6306		x	x	Not eligible
6307		x		Eligible

PVA 9				
Agency No.	Smithsonian No.	Historic	Prehistoric	NRHP Status
6308		x		Eligible
6309		x		Not eligible
6310		x	x	Not eligible
6311		x	x	Not eligible
6312		x		Eligible
6313		x	x	Not eligible
6314		x	x	Not eligible
6315		x	x	Not eligible
6316		x	x	Not eligible
6317		x	x	Not eligible
6318		x	x	Not eligible
6319		x	x	Not eligible
6320		x		Not eligible
6321		x	x	Not eligible
6322		x	x	Not eligible
6323		x		Eligible
6324		x	x	Not eligible
6325		x	x	Not eligible
6326		x	x	Not eligible
6327		x	x	Eligible
6328		x	x	Not eligible
6329		x	x	Not eligible
6330		x	x	Not eligible
6331		x	x	Not eligible
6332		x	x	Not eligible
6333		x		Not eligible
6334		x		Not eligible
6335		x	x	Eligible
6336		x		Not eligible
6337		x	x	Eligible
6338		x		Not eligible
6339		x		Eligible
6340		x		Eligible

PVA 9				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
6341		x		Eligible
6342		x		
6343		x		Not eligible
6344		x		Not eligible
6345		x		Eligible
6346		x		Not eligible
6347		x		
6399		x	x	Not eligible
6413		x		Eligible
6414		x		Not eligible
6415		x		Not eligible
6416		x		Not eligible
6417		x		Not eligible
6418		x	x	Not eligible
6419		x		Not eligible
6420		x		Not eligible

PVA 10				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1477	PE541	x	x	Undetermined

PVA 11				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
57	PE463	x	x	Undetermined
88	PE464	x		Undetermined
579	PE560	x		Not eligible
1480	PE545	x		Undetermined
1481	PE546	x	x	Undetermined
1483	PE340	x		Undetermined
1830	PE421	x		
1831	PE422	x		

PVA 11				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
2203	PE714	x	x	No Longer
2204	PE715	x	x	Not eligible
2253	PE730	x	x	Undetermined
2970	PE2016	x	x	
6261		x		Not eligible
6348		x		Not eligible
6629		x		Not eligible
6630		x		Not eligible
6631		x		Not eligible
6655		x		Not eligible
6656		x		Not eligible
6658		x		Not eligible

PVA 12				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	PE2537	x		Not eligible
2812	PE2010	x		Other
2978	PE2004	x	x	Not eligible
2979	PE2005	x		Not eligible
2980	PE2006	x	x	Not eligible
2981	PE2007	x	x	Not eligible
2982	PE2008	x		Not eligible
2983	PE2009	x		Not eligible
2984	PE2010		x	Not eligible
5581		x		Not eligible
5582		x	x	Not eligible

PVA 13				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	PE731	x		
	PE747	x		

PVA 13				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
	PE748	x		
3	PE607	x	x	Undetermined
4	PE460	x		
6	PE459	x	x	Undetermined
7	PE462	x	x	
54	PE471	x		Undetermined
55	PE472	x		Undetermined
56	PE473	x		Not eligible
465	PE2166	x		Undetermined
737	PE671	x		Undetermined
738	PE672	x		Undetermined
739	PE673	x	x	Not eligible
740	PE674	x		Undetermined
741	PE675	x	x	Undetermined
742	PE676	x	x	Not eligible
743	PE677	x	x	Eligible
744	PE678	x	x	Potentially
824	PE608	x	x	Undetermined
826	PE609	x		Undetermined
827	PE610	x		Undetermined
828	PE657	x		Undetermined
829	PE665	x	x	Undetermined
830	PE2087	x		Undetermined
831	PE2088	x	x	Undetermined
844	PE2089	x		Undetermined
845	PE2090	x	x	Undetermined
846	PE2091	x	x	Undetermined
847	PE2092	x	x	Undetermined
1160	PE2086	x	x	Undetermined
1360	PE126	x	x	Undetermined
1790	PE382	x	x	
1792	PE384	x		
1794	PE385	x		

PVA 13				
Agency No.	**Smithsonian No.**	**Historic**	**Prehistoric**	**NRHP Status**
1865	PE383	x	x	
2020	PE932	x	x	No Longer
2021	PE933	x	x	No Longer
2022	PE934	x	x	Not eligible
2023	PE935	x	x	Not eligible
2024	PE936	x	x	Not eligible
2025	PE937	x	x	Not eligible
2026	PE938	x		Not eligible
2177	PE2071	x	x	Not eligible
2178	PE2072	x		Not eligible
2179	PE2073	x	x	Not eligible
2180	PE2074	x		Not eligible
2538	PE736	x	x	Undetermined
2539	PE737	x	x	Undetermined
2540	PE738	x		Undetermined
2544	PE915	x		No Longer
2545	PE916	x		Not eligible
2546	PE917	x		No Longer
2547	PE918	x		No Longer
2548	PE919	x		Other
2549	PE920	x		Not eligible
2627	PE2121	x	x	Not eligible
2774	PE2075	x		Undetermined
2774	PE2075	x		Undetermined
2775	PE2076	x		Undetermined
2778	PE2079	x		Undetermined
2779	PE2080	x	x	Undetermined
2780	PE2081	x	x	Undetermined
2782	PE2083	x	x	Undetermined
3240	PE40	x		Eligible
6281		x	x	Not eligible
6282		x	x	Eligible
6283		x	x	Eligible

PVA 13				
Agency No.	Smithsonian No.	Historic	Prehistoric	NRHP Status
6284		x	x	Not eligible
6285		x	x	Not eligible
6286		x	x	Not eligible
6287		x	x	Not eligible
6288		x	x	Not eligible
6289		x	x	Not eligible
6290		x	x	Not eligible
6291		x	x	Not eligible
6292		x	x	Not eligible
6293		x	x	Not eligible
6294		x	x	Not eligible
6295		x	x	Eligible
6296		x	x	Not eligible
6297		x	x	Not eligible

FILE COPY

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Winnemucca Field Office
5100 East Winnemucca Boulevard
Winnemucca, Nevada 89445-2921
Phone: (775) 623-1500; Fax: (775) 623-1503
Email: wfoweb@nv.blm.gov
Website: http://www.nv.blm.gov/Winnemucca/

In Reply Refer To:
1610/8160 (NV-020)

APR 30 2002

«Prefix» «FirstName» «LastName» «Title»
«OrganizationName»
«Address»
«City» «State» «PostalCode»

Dear «Salutation» «LastName»:

To facilitate development of alternative energy sources, the Bureau of Land Management (BLM), Winnemucca Field Office is working to expedite processing of as many proposed geothermal energy leases as possible by October 1, 2002. As of April 1, 2002, the BLM had received 45 applications. Based on existing information, the BLM has determined that some of the proposed leases may be in areas that are environmentally sensitive. For your information, enclosed are the legal descriptions of the pending lease applications and a map showing their locations and the locations of Known Geothermal Resource Areas (KGRAs) and Prospectively Valuable Geothermal Areas (PVGAs).

PVGAs are broadly defined geographic areas in which valuable geothermal resources might be located. By themselves PVGAs do not create potential impacts to resources on the ground.

KGRAs are areas where there are known, developable geothermal resources. A KGRA designation highlights areas for potential lease bidders as highly likely to be developable, but does not lead directly to impacts on the ground. In contrast to PVGAs where leases can be awarded without competition, all leases issued in KGRAs have to be awarded using a competitive process.

Leasing is subject to the requirements of government-to-government consultation with Native American tribes, but does not directly authorize activities that could impact resources of concern to Native American tribes. A lease allows the lessee to submit applications to develop geothermal resources within the lease boundaries, but actual ground disturbing development on a lease would only be approved after a site specific environmental review is completed. This environmental review would include follow-up consultation with Native American tribes. This means that resources of concern to Native American tribes could be affected only if actual development on the lease is authorized in the future.

BLM policy is to coordinate and consult with appropriate Native American tribes and other groups to identify and consider their concerns in land use decision-making. This letter is a first step in the consultation process. I ask you to respond by May 13, 2002 if you have concerns with any of the proposed lease locations, or with the KGRAs or PVGAs. We are especially interested in identifying Traditional Cultural Properties or other areas of traditional use or religious significance that may be impacted by development of the proposed leases, but also welcome your input on any other aspects of the proposed leases, or of the KGRAs or PVGAs.

To ensure that lessees are aware of the need for Native American consultation for all development activities done in the lease areas, each lease will, at a minimum, include the following stipulation:

> "All development activities proposed under the authority of this lease are subject to the requirement for Native American consultation prior to BLM authorizing the activity. Depending on the nature of the lease developments proposed and the resources potentially affected, Native American consultation and mitigation measures to avoid significant impacts could significantly extend time frames for processing authorizations for development activities and change the ways in which developments are implemented."

BLM will formally consult with you on any proposed future development activities associated with these leases. During the consultation BLM will be able to provide you with detailed information on proposed developments and solicit your comments on the impacts these developments could potentially have on resources you have identified as being of concern during consultation.

In order to respond to the national energy crisis, the BLM has been asked to process non-sensitive geothermal lease proposals as rapidly as practicable, however, we remain committed to providing tribes with the opportunity to participate in the approval process for future leases and on-the-ground lease developments.

Therefore, we are asking you to consult with us on any concerns you have regarding the proposed leases. We are also asking you to tell us of any concerns you may have with the KGRAs and PVGAs outlined on the enclosed map.

The BLM has retained Ms. Ginny Bengston of the cultural resources consulting firm SWCA (there is no accurate full name other than SWCA) to coordinate meetings between the BLM and appropriate federally recognized tribal governments. Ms. Bengston will also serve as a third party observer to collect information from tribes. As a follow-up to this letter, Ms. Bengston will contact you to elicit comments and concerns about this undertaking and will report her findings to the BLM. The BLM will then initiate formal consultation to identify and manage heritage resources that could be impacted.

If you require additional information, or would like to schedule a meeting, please contact Ms. Ginny Bengston at (775) 826-1700 or Pat Barker, Native American Program Manager in the BLM Nevada State Office in Reno at (775) 861-6482.

Sincerely,

MICHAEL R. HOLBERT (Acting)

Terry A. Reed
Field Manager

2 Enclosures:
1. Legal Descriptions of Proposed Leases
2. Map of Lease Locations, KGRAs & PVGAs

cc:
Robert Hunter, BIA Nevada, Western Agency
Paul Young, BIA Nevada Eastern Agency
Sherrada James, Executive Director, Nevada Indian Commission
SHPO

LEGAL DESCRIPTIONS OF PROPOSED LEASES ON THE WINNEMUCCA BLM DISTRICT 04/29/2002

Applicant Name	App #	Legal Location Sec/ Twp/ Rng	Lot #s	Description	Detailed Description	Date of App	BLM Field Office
PHILLIP DAVIS	NVN 060215	21 34N 41E		ENTIRE SECTION		08/28/95	Winn FO
PHILLIP DAVIS	NVN 060215	21 0340N 0410E		ENTIRE SECTION		08/28/95	Winn FO
PHILLIP DAVIS	NVN 060215	21 0340N 0410E		ENTIRE SECTION		08/28/95	Winn FO
PHILLIP DAVIS	NVN 060215	21 0340N 0410E		ENTIRE SECTION		08/28/95	Winn FO
PHILLIP DAVIS	NVN 060215	21 0340N 0410E		ENTIRE SECTION		08/28/95	Winn FO
MICHAEL STEWART	NVN 065655	21 0330N 0230E	1-10,12-14	N2SW	E2 of Lot 11	06/21/99	Winn FO
MICHAEL STEWART	NVN 065655	21 0330N 0230E	1-5,7,8	NENW, S2NW,S2	W2 of Lot 6	06/21/99	Winn FO
MICHAEL STEWART	NVN 065655	21 0330N 0230E	1-9	NE	E2 of Lot 10	06/21/99	Winn FO
EMPIRE ENERGY	NVN 066270	21 0340N 0260E		ENTIRE SECTION		02/18/00	Winn FO
EMPIRE ENERGY	NVN 066271	21 0370N 0260E		ENTIRE SECTION		02/18/00	Winn FO
EMPIRE ENERGY	NVN 066272	21 0400N 0240E		ENTIRE SECTION		02/18/00	Winn FO
MICHAEL STEWART	NVN 066403	21 0340N 0230E		E2E2		04/14/00	Winn FO
MICHAEL STEWART	NVN 066403	21 0340N 0230E	1-4	W2E2,W2		04/14/00	Winn FO
MICHAEL STEWART	NVN 066403	21 0340N 0230E		NENE,S2NE, SE,E2SW		04/14/00	Winn FO
MICHAEL STEWART	NVN 066404	21 0330N 0230E	1-4	S2N2,S2		04/14/00	Winn FO
MICHAEL STEWART	NVN 066404	21 0330N 0230E	3,4	S2N2,N2S2,N ESW,S2SE		04/14/00	Winn FO
MICHAEL STEWART	NVN 066404	21 0330N 0230E		NW,N2SW, SWSW		04/14/00	Winn FO
MICHAEL STEWART	NVN 066404	21 0330N 0230E	1-4	W2E2,W2		04/14/00	Winn FO
MICHAEL STEWART	NVN 066404	21 0330N 0230E		W2NW, NWSW		04/14/00	Winn FO
VULCAN ENERGY	NVN 066742	21 0250N 0350E		ENTIRE SECTION		06/30/00	Winn FO
VULCAN ENERGY	NVN 066743	21 0250N 0360E		ENTIRE SECTION		06/30/00	Winn FO
VULCAN ENERGY	NVN 066743	21 0250N 0360E		ENTIRE SECTION		06/30/00	Winn FO

MIKE EVANS	NVN 073698	21 0290N 0360E	1-4	S2N2,SE, N2SW	08/10/00	Winn FO
MIKE EVANS	NVN 073698	21 0290N 0360E	1-4	S2N2,S2	08/10/00	Winn FO
MIKE EVANS	NVN 073698	21 0290N 0360E		ENTIRE SECTION	08/10/00	Winn FO
MIKE EVANS	NVN 073698	21 0290N 0360E		NE,S2NW, S2	08/10/00	Winn FO
MICHAEL STEWART	NVN 074196	21 0300N 0230E		ENTIRE SECTION	01/12/00	Winn FO
LEWIS KATZ	NVN 074233	21 0310N 0390E		ENTIRE SECTION	01/29/01	Winn FO
VULCAN ENERGY	NVN 074247	21 0270N 0320E		ENTIRE SECTION	01/29/01	Winn FO
VULCAN ENERGY	NVN 074247	21 0270N 0320E		ENTIRE SECTION	01/29/01	Winn FO
VULCAN ENERGY	NVN 074247	21 0270N 0320E		ENTIRE SECTION	01/29/01	Winn FO
VULCAN ENERGY	NVN 074247	21 0270N 0320E		ENTIRE SECTION	01/29/01	Winn FO
MIKE EVANS	NVN 074276	21 0320N 0380E		ENTIRE SECTION	02/09/01	Winn FO
MIKE EVANS	NVN 074276	21 0320N 0380E		N2N2	02/09/01	Winn FO
MIKE EVANS	NVN 074276	21 0320N 0390E		ENTIRE SECTION	02/09/01	Winn FO
MIKE EVANS	NVN 074276	21 0320N 0390E		ENTIRE SECTION	02/09/01	Winn FO
EARTH POWER RES INC	NVN 074299	21 0310N 0390E		NE,E2NW, SWNW,S2	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074299	21 0310N 0390E		N2,SE,S2SW, NWSW	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074299	21 0310N 0390E		N2,SE,S2SW, NWSW	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074299	21 0310N 0390E		ENTIRE SECTION	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074300	21 0400N 0280E		ENTIRE SECTION	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074300	21 0400N 0280E		ENTIRE SECTION	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074301	21 0400N 0280E		ENTIRE SECTION	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074301	21 0400N 0280E	3,4	E2SW.N2SE	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074301	21 0400N 0280E	1-4	E2W2.E2	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074301	21 0400N 0280E		NW,W2NE,S ENE,S2	02/27/01	Winn FO

EARTH POWER RES INC	NVN 074304	21 0320N 0390E		ENTIRE SECTION	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074305	21 0460N 0280E		ENTIRE SECTION	02/27/01	Winn FO
EARTH POWER RES INC .	NVN 074305	21 0460N 0280E		NE,N2NW, S2	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074305	21 0460N 0280E		ENTIRE SECTION	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074306	21 0460N 0280E	1-12	S2	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074306	21 0460N 0280E		ENTIRE SECTION	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074306	21 0470N 0290E	1-4	E2W2,E2	02/27/01	Winn FO
EARTH POWER RES INC	NVN 074306	21 0470N 0290E	1-4	E2W2,E2	02/27/01	Winn FO
WIN-ELDRICH GOLD INC	NVN 074475	21 0440N 0270E		ENTIRE SECTION	03/23/01	Winn FO
WIN-ELDRICH GOLD INC	NVN 074475	21 0440N 0270E	1-14	N2,N2SW, SESW,SE	03/23/01	Winn FO
WIN-ELDRICH GOLD INC	NVN 074475	21 0440N 0270E		ENTIRE SECTION	03/23/01	Winn FO
WIN-ELDRICH GOLD INC	NVN 074476	21 0460N 0280E		ENTIRE SECTION	03/23/01	Winn FO
WIN-ELDRICH GOLD INC	NVN 074476	21 0460N 0280E		ENTIRE SECTION	03/23/01	Winn FO
WIN-ELDRICH GOLD INC	NVN 074476	21 0470N 0290E		ENTIRE SECTION	03/23/01	Winn FO
WIN-ELDRICH GOLD INC	NVN 074476	21 0470N 0300E		ENTIRE SECTION	03/23/01	Winn FO
MIKE EVANS	NVN 074541	21 0312N 0330E		ENTIRE SECTION	04/17/01	Winn FO
MIKE EVANS	NVN 074541	21 0312N 0330E		ENTIRE SECTION	04/17/01	Winn FO
MIKE EVANS	NVN 074541	21 0320N 0330E		SWSW	04/17/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074578	21 0340N 0230E		E2,E2W2	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074578	21 0340N 0230E		NE,SENW, N2SE,SESE	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074579	21 0340N 0230E		W2	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074579	21 0340N 0230E		ENTIRE SECTION	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074579	21 0340N 0230E		ENTIRE SECTION	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074579	21 0340N 0230E		W2	05/01/01	Winn FO

BRIGHT-HOLLAND CO	NVN 074580	21 0340N 0230E		E2SE	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074580	21 0340N 0230E		SWNW, NWSW	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074580	21 0340N 0230E		ENTIRE SECTION	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074580	21 0340N 0230E	2-12	W2	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074580	21 0340N 0230E		SW	05/01/01	Winn FO
BRIGHT-HOLLAND CO	NVN 074580	21 0340N 0230E		NENE,S2NE, SENW	05/01/01	Winn FO
ROBELEY E BERRY	NVN 074656	21 0410N 0410E		S2NW,S2	05/17/01	Winn FO
ROBELEY E BERRY	NVN 074656	21 0410N 0410E		NE,N2NW, NESE,S2SW	05/17/01	Winn FO
ROBELEY E BERRY	NVN 074656	21 0410N 0410E		N2,N2S2	05/17/01	Winn FO
ROBELEY E BERRY	NVN 074656	21 0410N 0410E		ENTIRE SECTION	05/17/01	Winn FO
SANDROCK GEORGE S	NVN 074765	21 0360N 0340E		ENTIRE SECTION	06/11/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074853	21 0370N 0390E		ENTIRE SECTION	06/14/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074854	21 0260N 0350		ENTIRE SECTION	06/14/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074855	21 0330N 0400E		N2	06/14/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074855	21 0330N 0400E		N2	06/14/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074871	21 0220N 0280E	5,6		06/15/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074871	21 0220N 0280E		ENTIRE SECTION	06/14/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074871	21 0220N 0280E	1-4	S2N2,S2	06/15/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074871	21 0220N 0280E	1-7	SENE,E2SW	06/15/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074872	21 0220N 0280E		ENTIRE SECTION	06/15/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074872	21 0220N 0280E		ENTIRE SECTION	06/15/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074872	21 0220N 0280E	1-4	E2W2,E2	06/15/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074873	21 0220N 0280E	1-4	S2N2,S2	06/15/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074873	21 0220N 0280E		ENTIRE SECTION	06/15/01	Winn FO

SIERRA NEVADA GEO INC	NVN 074873 21 0220N 0280E		ENTIRE SECTION	06/15/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074873 21 0220N 0280E		ENTIRE SECTION	06/15/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074883 21 0270N 0400E		ENTIRE SECTION	06/19/01	Winn FO
SIERRA NEVADA GEO INC	NVN 074883 21 0270N 0400E		N2,SW,NWS E,S2SE	06/19/01	Winn FO
SANDROCK /TOROCK	NVN 074902 21 0280N 0320E		W2	06/22/01	Winn FO
SANDROCK /TOROCK	NVN 074903 21 0340N 0360E		ENTIRE SECTION	06/22/01	Winn FO
SANDROCK /TOROCK	NVN 074903 21 0350N 0360E		ENTIRE SECTION	06/22/01	Winn FO
SANDROCK /TOROCK	NVN 074903 21 0350N 0360E		ENTIRE SECTION	06/22/01	Winn FO
WIN-ELDRICH GOLD INC	NVN 074905 21 0450N 0280E		ENTIRE SECTION	06/25/01	Winn FO
EARTH POWER RES INC	NVN 074913 21 0230N 0240E		ENTIRE SECTION	06/29/01	Winn FO
EARTH POWER RES INC	NVN 074913 21 0230N 0240E		ENTIRE SECTION	06/29/01	Winn FO
EARTH POWER RES INC	NVN 074913 21 0230N 0240E		ENTIRE SECTION	06/29/01	Winn FO
EARTH POWER RES INC	NVN 074913 21 0230N 0250E		ENTIRE SECTION	06/29/01	Winn FO
EARTH POWER RES INC	NVN 074914 21 0230N 0240E	1-4	S2N2,S2	06/29/01	Winn FO
EARTH POWER RES INC	NVN 074914 21 0230N 0240E		E2E2NW, W2NWNE, SWNE	06/29/01	Winn FO
EARTH POWER RES INC	NVN 074914 21 0230N 0250E	1-14	S2N2,S2	06/29/01	Winn FO
EARTH POWER RES INC	NVN 074914 21 0240N 0240E		ENTIRE SECTION	06/29/01	Winn FO
SANDROCK TOROK	NVN 075419 21 0280N 0320E		ENTIRE SECTION	11/27/01	Winn FO
EMPIRE ENERGY	NVN 075552 21 0300N 0230E		ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075552 21 0300N 0230E		ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075552 21 0300N 0230E		ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075552 21 0300N 0230E		ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075553 21 0300N 0220E		W2	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075553 21 0300N 0220		ENTIRE SECTION	1/29/02	Winn FO

EMPIRE ENERGY	NVN 075553 21 0300N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075553 21 0300N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075554 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075554 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075554 21 0300N 0230E	N2	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075554 21 0300N 0230E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075555 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075555 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075555 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075555 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075556 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075556 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075556 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075556 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075557 21 0290N 0230E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075557 21 0290N 0230E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075558 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO
EMPIRE ENERGY	NVN 075558 21 0290N 0220E	ENTIRE SECTION	1/29/02	Winn FO

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Winnemucca Field Office
5100 East Winnemucca Boulevard
Winnemucca, Nevada 89445-2921
(775) 623-1500
Email: wfoweb@nv.blm.gov
Website: http://www.nv.blm.gov/Winnemucca/

MAY 15 2002

In Reply Refer To:
1330 (NV-020)

Dear Interested Public:

In May 2001, the President adopted a National Energy Policy to respond to our Nation's increasing energy needs. In response to this policy, the Bureau of Land Management (BLM) developed an implementation strategy to streamline energy development on public lands.

BLM, Nevada has received numerous applications to lease public lands for geothermal resources. A large number of these applications are located within the administrative boundary of the Winnemucca Field Office. In order to expedite processing of pending lease applications and to meet the intent of the National Energy Policy, the Winnemucca Field Office is preparing a Programmatic Environmental Assessment (EA) to comply with the requirements of the National Environmental Policy Act. The EA will provide a broad scope analysis, addressing cumulative impacts of reasonably foreseeable geothermal development and exploration scenarios. The EA will assist BLM in developing lease stipulations and conditions of approval for all new geothermal leases within the assessment area. The public scoping period will end at the close of business June 14, 2002.

We have scheduled two public scoping meetings to present the proposed action. We have opted to use an informal, open house format. You are cordially invited to meet with us to present your ideas or concerns.

Date	*Location*	*Time*
May 29, 2002	BLM Winnemucca Field Office 5100 East Winnemucca Blvd. Winnemucca, Nevada	7:00 PM – 9:00 PM
May 30, 2002	Lovelock Community Center 830 6th Street Lovelock, Nevada	7:00 PM – 9:00 PM

We expect our Programmatic EA to be released to the public on or about August 8, 2002 and will provide a 14-day public comment period.

For more information, and/or to submit your comments electronically, please visit our web site at: www.nv.blm.gov/winnemucca/geed. If you have questions or need additional information, please contact Jeff Johnson, Planning and Environmental Coordinator at (775) 623-1500.

Sincerely,

Terry A Reed

Terry A. Reed
Field Manager

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
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Sincerely,

Terry A Reed

Terry A. Reed
Field Manager

APPENDIX G
BLM WINNEMUCCA FIELD OFFICE
GEOTHERMAL LEASE STIPULATIONS

CONTINGENCY RIGHTS STIPULATION

The Bureau of Land Management has reviewed existing information and planning documents and, except as noted in other attached stipulations, knows of no reason why normal development—subject to the controls of applicable laws and regulations and the lease terms and conditions—can not proceed on the leased lands. However, specific development activities could not be identified prior to lease issuance since the nature and extent of geothermal resources were not known and specific operations have not been proposed. The lessee is herby made aware that consistent with 43 CFR §3200.4, all post lease operations will be subject to appropriate environmental review and may be limited or denied by no surface occupancy stipulations.

The following geothermal lease stipulations are specifically identified in the Sonoma-Gerlach and Paradise-Denio Management Framework Plans (MFPs):

Geothermal Lease Stipulations – Sonoma-Gerlach MFP

1. No Surface Occupancy – special stipulations for no surface occupancy will be applied to the following:

    - Visible remnants of the Applegate-Lassen Trail from Rye Patch Reservoir to the Western Pacific Railroad track near Trego. In this area the trail is defined as the actual trail itself. Applicable to the following lease:

        - NVN-066271 – T37N, R26E, Sec. 28

    - Sage grouse strutting grounds/Leks
    - The George Lund Petrified Forest
    - The Soldier Meadows desert dace Area of Critical Environmental Concern (ACEC) *
    - S-1 Cultural Sites (National Register Eligible)

2. No Leasing

    - No leasing will be permitted on community watersheds and the Mahogany Creek Natural Area

* No Leasing – This area is within the boundary of the Black Rock Desert – High Rock Canyon National Conservation Area (NCA).

Geothermal Lease Stipulations – Paradise-Denio MFP

Noncompetitive areas and all KGRAs will be open to geothermal, oil, and gas leasing with the following restrictions:

1. No Leasing – the following areas meet the above criteria and will not be leased:

    - Pine Forest Vehicle Closure Area (Blue Lakes)

2. No Surface Occupancy – no surface occupancy will be allowed on the following:

    - Sage grouse strutting grounds
    - Osgood Mountain milk vetch ACEC
    - Raised bog
    - S-1 Cultural sites (National Register Eligible)
    - The Applegate-Lassen Emigrant trail**

3. Special Stipulations – the following will be leased with special stipulations:

    - Critical wildlife habitat areas
    - Black Rock Desert

4. Incorporation by Reference

    - The geothermal stipulation/mitigation measures section and matrix, Tables 4-1 and 4-2 of the *District Regional Geothermal Oil and Gas Leasing Environmental Assessment, (EA-NV-020-02-38), June 1982,* are hereby incorporated into this analysis and their stipulations apply to PVAs, KGRAs, and pending lease application sites.

5. No Leasing – NCA

In addition to stipulations identified in the MFPs and the *District Regional Geothermal Oil and Gas Leasing Environmental Assessment*, the following stipulations apply:

- In December 2000, the President signed Public Law 106-554, establishing the Black Rock Desert-High Rock Canyon Emigrant Trails NCA. The legislation specifically withdrew geothermal resources from leasing on lands located within the NCA. The NCA boundary incorporates a large portion of the Applegate-Lassen Trail.

** No leasing – In areas located within the Black Rock Desert-High Rock Canyon NCA.

HYDROLOGY AND WATER QUALITY

Water Resources

- As exploration and development activities commence, the operator will institute a hydrologic monitoring program. The details of the monitoring programs will be site-specific and the intensity will be commensurate with the level of exploration. For example, if the proponent will be conducting seismic studies the monitoring would be limited to the identification of water resources to be monitored as activities continue; if a drilling program were to be undertaken the number of aquifers encountered, their properties, their quality, and their saturated thickness will be documented. The information collected will be submitted to the Bureau of Land Management and will be used to support future NEPA documentation as development progresses.

- Adverse impacts to surface expressions of the geothermal reservoir (hot springs), and threatened and endangered species habitat are not acceptable. The leasee will monitor the quality, quantity, and temperature of any hot springs or other water resource within the project area whenever they are conducting activities, which have the potential to impact those resources. If adverse impacts do occur, BLM will require the lessee to take corrective action to mitigate the impact. Corrective action may include shutting down the operation.

- These are in addition to the other stipulations. These are LEASE stipulations, not operational. The information gathered under the monitoring stipulation will be used to identify future impacts at the operational stage.

VEGETATION

1. <u>Controlled or Limited Surface Use</u> (avoidance and/or mitigation measures to be developed).

- All areas of exploration and/or development disturbance will be reclaimed including recontouring disturbed areas to blend with the surrounding topography and using appropriate methods to seed with a diverse perennial seed mix. The seed mix used to reclaim disturbed areas would be "certified" weed free.

Riparian Areas

- Any open body of water, such as a canal, ditch, slough, pond, creek, lake, or stream and riparian areas will be avoided by a buffer zone of 650 feet. This buffer may be greater as determined by the WFO, in order to sufficiently protect riparian areas against adverse impacts such as increased sedimentation, impacts to water quality and quantity and loss of riparian vegetation.

NOXIOUS WEEDS

- Areas to be developed will be inventoried for the presence of noxious weeds before disturbance. During close out operations, sites will be inventoried for the presence of noxious weeds and treated if weeds are present.

LANDS & REALTY

- No drilling, including exploration or development activities within linear rights-of-way

WILDLIFE, MIGRATORY BIRDS, AND FISHERIES

Sage grouse

1. No Surface Occupancy

- No surface occupancy within 3.3 km (2 miles) of sage grouse strutting grounds/leks because they are a critical habitat

2. Controlled or Limited Surface Use (avoidance and/or required mitigation measures to be developed)

These additional stipulations are based on the Interim Sage Grouse Management Guidelines for Nevada:

- Avoid all activity within 1.0 km (.6 miles) of known habitat as determined by the WFO

- Avoid permanent occupancy of potential habitat where possible; where not possible, consider off-site mitigation

- Nesting and brooding habitat – avoid all activity within 1.0 km (.6 miles) of known nesting and brooding habitat as determined by the WFO

- Known winter habitat – avoid all activity within 1.0 km (.6 miles) of known winter habitat as determined by the WFO

- Known summer habitat – avoid all activity within 1.0 km (.6 miles) of known summer habitat as determined by the WFO

- All surface disturbance occurring in potential or know habitat areas shall be reclaimed as soon as possible in such a way as to result in conditions suitable for sage grouse habitat

3. Controlled or Limited Surface Use (avoidance and/or required mitigation measures to be developed) – applicable for all leases proposed in areas of crucial deer, antelope, and big horn sheep habitat during migration and critical fawning and kidding areas.

Migratory Birds

- Ground disturbing activities during the migratory bird-nesting season (March to July) shall not be conducted in order to avoid potential violation of the Migratory Bird Act of 1918. Should ground-disturbing activities be necessary during this period, appropriate inventories for migratory birds shall be conducted prior to site development. This survey would identify either breeding adult birds or nest sites within the areas to be disturbed. If active nests are present, the proponent would coordinate with the BLM to develop appropriate protection measures for these sites, which may include avoidance, construction constraints, and/or establish buffers.

Other Biota

- Prior to site development, a survey for invertebrates will be conducted on areas where geothermal surface expressions occur

THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

1. No surface occupancy

- No surface occupancy within 1 mile of occupied or identified potential Lahontan Cutthroat Trout (LCT) habitat. This stipulation is applicable to the following leases; however, other leases may apply pending their location with respect to LCT habitat:

  - NVN-066403 – T34N, R23E – Secs 25, 34, & 36
  - NVN-074580 – T34N, R23E – Secs 2 & 3

2. Controlled or Limited Surface Use (avoidance and/or mitigation measures to be developed)

- Appropriate inventories for sensitive species of vegetation and wildlife shall be conducted prior to site development. If sensitive species are located on sites proposed for development, it may be necessary to exclude disturbance, develop mitigation measures, and/or avoid the species.

WILD HORSES AND BURROS

1. Controlled or Limited Surface Use (avoidance and/or mitigation measures to be developed)

   - If wild horse or burro populations are located on sites proposed for development, it may be necessary to avoid and/or develop mitigation measures to reduce adverse impacts to horses and/or burros. These measures may include providing alternative water sources for horses and/or burros of equal quality and quantity.

CULTURAL RESOURCES

1. No Surface Occupancy

   - No surface occupancy within the setting of National Register-eligible sites where integrity of setting is critical to their eligibility

2. Controlled or Limited Surface Use (avoidance and/or mitigation measures to be developed).

   - All surface disturbing activities proposed after issuance of the lease are subject to compliance with Section 106 of the National Historic Protection Act (NHPA) and it's implementation through the protocol between the BLM Nevada State Director and the Nevada State Historic Preservation Officer.

NATIVE AMERICAN CONSULTATION

1. No Surface Occupancy

   - No surface occupancy within the setting of National Register-eligible Traditional Cultural Properties where integrity of the setting is critical to their eligibility. Applicable to the following leases:

     - NVN-066742 – T25N, R35E – Secs. 13 & 35
     - NVN-974854 – T25N, R36E – Secs. 07 & 18

   - For development and production phases, surface occupancy may be limited to a specific distance or precluded at hot springs, pending conclusion of the Native American consultation process. Applicable to the following leases:

     - NVN-066270 – T34N, R26E – Sec. 31
     - NVN-073698 – T29N, R36E – Secs 1, 2, 11, 12
     - NVN-074300 – T40N, R28E – Secs 16 & 21
     - NVN-074306 - T46N, R28E – Sec. 13
     - NVN-074881 – T27N, R40E – Secs 28 & 29

- NVN-074881 – T27N, R40 E – Secs 32 & 33
- NVN-074656 – T41N, R41E – Secs 19 & 20
- NVN-074276 – T32N, R38E – Secs 25 & 36
- NVN-074276 – T32N, R39E – Sec 30
- NVN-074304 – T32N, R28E – Sec. 13

- All development activities proposed under the authority of this lease are subject to the requirement for Native American consultation prior to BLM authorizing the activity. Depending on the nature of the lease developments proposed and the resources potentially affected, Native American consultation and mitigation measures to avoid significant impacts could significantly extend time frames for processing authorizations for development activities and change the ways in which developments are implemented.

HAZARDOUS MATERIALS/WASTE AND SOLID WASTE

- Prior to exploration and development, an emergency response plan will developed that includes contingencies for hazardous material spills and disposal.

PALEONTOLOGY

- Where significant paleontological resources are identified, mitigating measures such as data recovery, restrictions on development, and deletion of some areas from development may be required on a case-by-case basis.

APPENDIX H
PENDING LEASE APPLICATIONS

Serial Number	Name	Township	Range	Section	Aliquot Part	Acres
NVN 060215	PHILLIP DAVIS	0340N	0410E	6	ENTIRE SECTION	543.587
NVN 060215	PHILLIP DAVIS	0340N	0410E	4	ENTIRE SECTION	551.733
NVN 060215	PHILLIP DAVIS	0340N	0410E	8	ENTIRE SECTION	640.456
NVN 060215	PHILLIP DAVIS	0340N	0410E	18	ENTIRE SECTION	604.794
NVN 060215	PHILLIP DAVIS	0340N	0410E	16	ENTIRE SECTION	636.512
NVN 065655	MICHAEL STEWART	0330N	0230E	3	N2SW	723.687
NVN 065655	MICHAEL STEWART	0330N	0230E	11	NENW,S2NW,S2	786.227
NVN 065655	MICHAEL STEWART	0330N	0230E	12	NE	738.006
NVN 066270	EMPIRE ENERGY	0340N	0260E	31	ENTIRE SECTION	615.748
NVN 066271	EMPIRE ENERGY	0370N	0260E	28	ENTIRE SECTION	643.218
NVN 066272	EMPIRE ENERGY	0400N	0240E	13	ENTIRE SECTION	701.286
NVN 066403	MICHAEL STEWART	0340N	0230E	25	E2E2	693.699
NVN 066403	MICHAEL STEWART	0340N	0230E	34	W2E2,W2	671.805
NVN 066403	MICHAEL STEWART	0340N	0230E	36	NENE,S2NE,SE,E2SW	702.926
NVN 066404	MICHAEL STEWART	0330N	0230E	2	S2N2,N2S2,NESW,S2SE	648.113
NVN 066404	MICHAEL STEWART	0330N	0230E	1	S2N2,S2	669.816
NVN 066404	MICHAEL STEWART	0330N	0230E	27	W2E2,W2	647.994
NVN 066404	MICHAEL STEWART	0330N	0230E	26	NW,N2SW,SWSW	644.775
NVN 066404	MICHAEL STEWART	0330N	0230E	35	W2NW,NWSW	650.591
NVN 066742	VULCAN ENERGY	0250N	0350E	13	ENTIRE SECTION	623.921
NVN 066743	VULCAN ENERGY	0250N	0360E	7	ENTIRE SECTION	616.566

Serial Number	Name	Township	Range	Section	Aliquot Part	Acres
NVN 066743	VULCAN ENERGY	0250N	0360E	18	ENTIRE SECTION	608.406
NVN 073698	MIKE EVANS	0290N	0360E	1	S2N2,SE,N2SW	667.233
NVN 073698	MIKE EVANS	0290N	0360E	2	S2N2,S2	632.052
NVN 073698	MIKE EVANS	0290N	0360E	11	ENTIRE SECTION	636.06
NVN 073698	MIKE EVANS	0290N	0360E	12	NE,S2NW,S2	636.159
NVN 074196	MICHAEL STEWART	0300N	0230E	33	ENTIRE SECTION	642.401
NVN 074233	LEWIS KATZ	0310N	0390E	27	ENTIRE SECTION	647.966
NVN 074247	VULCAN ENERGY	0270N	0320E	12	ENTIRE SECTION	646.792
NVN 074247	VULCAN ENERGY	0270N	0320E	14	ENTIRE SECTION	654.196
NVN 074247	VULCAN ENERGY	0270N	0320E	2	ENTIRE SECTION	410.916
NVN 074247	VULCAN ENERGY	0270N	0320E	10	ENTIRE SECTION	633.818
NVN 074276	MIKE EVANS	0320N	0380E	25	ENTIRE SECTION	640.511
NVN 074276	MIKE EVANS	0320N	0390E	30	ENTIRE SECTION	636.1
NVN 074276	MIKE EVANS	0320N	0380E	36	N2N2	667.56
NVN 074299	EARTH POWER RES INC	0310N	0390E	21	NE,E2NW,SWNW,S2	635.969
NVN 074299	EARTH POWER RES INC	0310N	0390E	22	N2,SE,S2SW,NWSW	635.19
NVN 074299	EARTH POWER RES INC	0310N	0390E	28	ENTIRE SECTION	652.829
NVN 074300	EARTH POWER RES INC	0400N	0280E	16	ENTIRE SECTION	841.746
NVN 074300	EARTH POWER RES INC	0400N	0280E	21	ENTIRE SECTION	542.165
NVN 074301	EARTH POWER RES INC	0400N	0280E	18	E2SW,N2SE	858.931
NVN 074301	EARTH POWER RES INC	0400N	0280E	17	ENTIRE SECTION	710.97
NVN 074301	EARTH POWER RES INC	0400N	0280E	19	E2W2,E2	767.655
NVN 074301	EARTH POWER RES INC	0400N	0280E	20	NW,W2NE,SENE,S2	488.921
NVN 074304	EARTH POWER RES INC	0320N	0390E	31	ENTIRE SECTION	652.978

Serial Number	Name	Township	Range	Section	Aliquot Part	Acres
NVN 074305	EARTH POWER RES INC	0460N	0280E	11	ENTIRE SECTION	641.302
NVN 074305	EARTH POWER RES INC	0460N	0280E	14	ENTIRE SECTION	638.989
NVN 074305	EARTH POWER RES INC	0460N	0280E	13	NE,N2NW,S2	639.381
NVN 074306	EARTH POWER RES INC	0460N	0280E	1	S2	751.195
NVN 074306	EARTH POWER RES INC	0460N	0280E	13	E2W2,E2	574.265
NVN 074306	EARTH POWER RES INC	0460N	0280E	24	E2W2,E2	568.533
NVN 074306	EARTH POWER RES INC	0460N	0280E	12	ENTIRE SECTION	637.233
NVN 074475	WIN-ELDRICH GOLD INC	0440N	0270E	1	ENTIRE SECTION	658.423
NVN 074475	WIN-ELDRICH GOLD INC	0440N	0270E	12	N2,N2SW,SESW,SE	644.868
NVN 074475	WIN-ELDRICH GOLD INC	0440N	0270E	14	ENTIRE SECTION	689.12
NVN 074476	WIN-ELDRICH GOLD INC	0470N	0300E	18	ENTIRE SECTION	644.779
NVN 074476	WIN-ELDRICH GOLD INC	0470N	0290E	25	ENTIRE SECTION	568.342
NVN 074476	WIN-ELDRICH GOLD INC	0460N	0280E	24	ENTIRE SECTION	642.894
NVN 074476	WIN-ELDRICH GOLD INC	0460N	0280E	26	ENTIRE SECTION	641.411
NVN 074541	MIKE EVANS	0320N	0330E	25	SWSW	633.632
NVN 074578	BRIGHT-HOLLAND CO	0340N	0230E	13	E2,E2W2	660.199
NVN 074578	BRIGHT-HOLLAND CO	0340N	0230E	24	NE,SENW,N2SE,SESE	686.854
NVN 074579	BRIGHT-HOLLAND CO	0340N	0230E	15	ENTIRE SECTION	725.933
NVN 074579	BRIGHT-HOLLAND CO	0340N	0230E	14	W2	613.168
NVN 074579	BRIGHT-HOLLAND CO	0340N	0230E	22	ENTIRE SECTION	719.242
NVN 074579	BRIGHT-HOLLAND CO	0340N	0230E	23	W2	618.879
NVN 074580	BRIGHT-HOLLAND CO	0340N	0230E	3	ENTIRE SECTION	757.457
NVN 074580	BRIGHT-HOLLAND CO	0340N	0230E	2	SWNW,NWSW	638.896
NVN 074580	BRIGHT-HOLLAND CO	0340N	0230E	1	E2SE	666.611

Serial Number	Name	Township	Range	Section	Aliquot Part	Acres
NVN 074580	BRIGHT-HOLLAND CO	0340N	0230E	10	W2	726.147
NVN 074580	BRIGHT-HOLLAND CO	0340N	0230E	11	SW	614.166
NVN 074580	BRIGHT-HOLLAND CO	0340N	0230E	12	NENE,S2NE,SENW	645.982
NVN 074656	ROBELEY E BERRY	0410N	0410E	20	NE,N2NW,NESE,S2SW	644.935
NVN 074656	ROBELEY E BERRY	0410N	0410E	21	N2,N2S2	634.822
NVN 074656	ROBELEY E BERRY	0410N	0410E	19	S2NW,S2	671.929
NVN 074656	ROBELEY E BERRY	0410N	0410E	22	ENTIRE SECTION	636.667
NVN 074765	SANDROCK GEORGE S	0360N	0340E	14	ENTIRE SECTION	638.517
NVN 074853	SIERRA NEVADA GEO INC	0370N	0390E	4	ENTIRE SECTION	637.122
NVN 074854	SIERRA NEVADA GEO INC	0260N	0350E	35	ENTIRE SECTION	656.521
NVN 074855	SIERRA NEVADA GEO INC	0330N	0400E	4	N2	599.345
NVN 074855	SIERRA NEVADA GEO INC	0330N	0400E	8	N2	630.222
NVN 074870	SIERRA NEVADA GEO INC	0300N	0410E	29	N2,N2S2,SWSW	641.937
NVN 074871	SIERRA NEVADA GEO INC	0330N	0400E	6	ENTIRE SECTION	662.729
NVN 074871	SIERRA NEVADA GEO INC	0220N	0280E	4		657.001
NVN 074871	SIERRA NEVADA GEO INC	0220N	0280E	7	S2N2,S2;	642.859
NVN 074871	SIERRA NEVADA GEO INC	0220N	0280E	8	SENE,E2SW	633.356
NVN 074872	SIERRA NEVADA GEO INC	0220N	0280E	10	ENTIRE SECTION	626.823
NVN 074872	SIERRA NEVADA GEO INC	0220N	0280E	18	E2W2,E2	636.965
NVN 074872	SIERRA NEVADA GEO INC	0220N	0280E	16	ENTIRE SECTION	645.539
NVN 074873	SIERRA NEVADA GEO INC	0220N	0280E	2	S2N2,S2;	680.112
NVN 074873	SIERRA NEVADA GEO INC	0220N	0280E	14	ENTIRE SECTION	645.251
NVN 074873	SIERRA NEVADA GEO INC	0220N	0280E	20	ENTIRE SECTION	655.436
NVN 074873	SIERRA NEVADA GEO INC	0220N	0280E	22	ENTIRE SECTION	645.469

Serial Number	Name	Township	Range	Section	Aliquot Part	Acres
NVN 074881	SIERRA NEVADA GEO INC	0270N	0400E	29	N2,SW,N2SE,SWSE	642.16
NVN 074881	SIERRA NEVADA GEO INC	0270N	0400E	28	ENTIRE SECTION	635.149
NVN 074883	SIERRA NEVADA GEO INC	0270N	0400E	32	ENTIRE SECTION	651.355
NVN 074883	SIERRA NEVADA GEO INC	0270N	0400E	33	N2,SW,NWSE,S2SE	645.078
NVN 074902	SANDROCK /TOROCK	0280N	0320E	26	W2	585.411
NVN 074903	SANDROCK /TOROCK	0350N	0360E	28	ENTIRE SECTION	649.498
NVN 074903	SANDROCK /TOROCK	0350N	0360E	32	SE	644.616
NVN 074903	SANDROCK /TOROCK	0340N	0360E	8	ENTIRE SECTION	640.132
NVN 074905	WIN-ELDRICH GOLD INC	0450N	0280E	25	ENTIRE SECTION	641.085
NVN 074913	EARTH POWER RES INC	0230N	0240E	10	ENTIRE SECTION	627.741
NVN 074913	EARTH POWER RES INC	0230N	0240E	12	ENTIRE SECTION	654.688
NVN 074913	EARTH POWER RES INC	0230N	0240E	14	ENTIRE SECTION	651.805
NVN 074913	EARTH POWER RES INC	0230N	0250E	32	ENTIRE SECTION	628.337
NVN 074914	EARTH POWER RES INC	0240N	0240E	36	ENTIRE SECTION	627.114
NVN 074914	EARTH POWER RES INC	0230N	0240E	2	E2E2NW,W2NWNE,SWNE,	692.029
NVN 074914	EARTH POWER RES INC	0230N	0250E	6	S2N2,S2	686.344
NVN 075419	SANDROCK TOROK	0280N	0320E	22	ENTIRE SECTION	640.281